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Overloaded Installations

Reasons and Remedies

AN applicant for a supply of electricity is required to state the maximum amount which he is likely to demand. A month's notice is stipulated in respect of any subsequent additions to the installation likely to cause that demand to be exceeded and the consumer may be asked to meet the cost of any alterations rendered necessary.

The normal domestic service, however, has a substantial margin of safety so that additions to the electrical equipment of a house seldom endanger the authority's service or meters, or the supply to other consumers. Consequently the requirement that such additions should be notified in advance is regularly evaded by consumers and, it must be admitted, without dire results as a rule.

Once a householder has had his house wired and has started off with a very incomplete electrical equipment he will later purchase as many of the smaller electrical appliances as possible. Can he be expected to inform the supply authority when he acquires a kettle, a hair dryer, a toaster, or a radio set from time to time? When he has plug points he will ask what they are for if he cannot connect up these appliances without a lot of fuss.

Lampholder Connections

Trouble arises when consumers with merely a lighting service and a meter capable of passing only a small current commence to load up their systems with small-power equipment. They are encouraged in this by the sale of appliances fitted with lampholder adaptors in spite of the restriction imposed by I.E.E. Regulation No. 606B, which of course is not enforceable. This lays down that no appliance consuming more than 2 amperes or which requires the earthing of metal parts shall be connected to a lampholder. This precludes the use of practically everything but insulation-covered hair dryers or radio sets, and yet it is common to find bowl fires or kettles loaded at anything up to 1,000 watts depending upon a lampholder for their supply.

The bulk of the cooker business is in the hands of the supply authorities themselves and so they have little to apprehend in this direction although occasionally a consumer may have a special circuit run for a privately purchased cooker. Fires are in a different category; there is far greater probability of these being installed without the knowledge of the authority and they may easily mean an addition of 4 or 6 kW to the demand and throw a strain upon a service designed for something much less.

Nowadays, of course, supply authorities should not seek to economise too much in copper and meters; provision should be made for the potential, and not merely for the immediate demand. This would minimise the possibility of trouble through overloading. Likewise where they are responsible for the internal wiring they should be generous, even if they add to the cost—they are casting bread upon the waters. As we said in our issue of November 18th, ideas regarding house wiring need revision. But as regards existing installations it should be possible to find means of preventing the "strengthening" of fuses by the consumer.

Inspection and Education

Although in the foregoing we have looked at the matter from the authority's point of view this aspect cannot be divorced from that of the consumer's safety. Overloaded installations and badly installed appliances are a menace which it is difficult to meet but one which should receive attention. Supply authorities' powers of supervision are severely circumscribed and can only be exercised after inspection. This to be of any value must be regular, and regular inspection would not be very popular with consumers and would not conduce to electrical progress. Nor, we think, will threats to institute proceedings improve matters. This has been proposed in a northern town, although what "proceedings" can be taken apart from cutting off the supply we do not know.

Much more good would be done by "kindness" and education. A supply authority could notify all its consumers of its willingness to give free advice regarding appliances and additions to installations. Most authorities do this to some extent, of course, but few of them, we think, actually go about it in a positive way—they wait until the consumer (always shy of "officialdom") approaches them. Another way of keeping an eye upon installations would be to instruct meter readers to ask what apparatus had been installed since their last visit, impressing upon the consumer that he was asked in his own interests.

The last thing that supply authorities should think of is "instituting proceedings." Far better is it to institute better relationships and regard the consumer as one who needs guidance rather than as a criminal who merits punishment.

Purchase Rights

THERE is a movement afoot to prevent the splitting-up of existing distribution areas by the exercise of their purchase rights by local authorities. *The Times* refers to the "perturbation among leading interests in the industry" at the Government's failure to find time to introduce legislation for the reorganisation of electricity distribution and says that during the next five years upwards of sixty undertakings are subject to purchasing options. This, of course, acts as a deterrent to development and it is therefore suggested that there shall be a "close" period of, say, five years during which these options should not be exercisable. It is certainly against the spirit of the McGowan Report that large and efficient undertakings should be broken up among local authorities but we think that the Commissioners' persuasive powers can usually be brought into play in such instances. If a general suspension is desirable, however, five years seems to be too short a time to be effective.

Power for Coal Mines

LAST year the tonnage of coal burned at collieries for producing power of all kinds was equivalent to at least 80 per cent. of the whole amount used by public electricity undertakings. Yet the kWh generated by colliery plants was appreciably less than one-tenth of that produced by the undertakings and the residue of non-electrical plant is believed to be only about 1,000,000 HP (compared with over 2,000,000 already electrified). The weight of coal required per kWh, therefore, clearly reaches extravagant dimensions. It is said that a large proportion of the coal used is unsaleable (perhaps "not worth transporting" would be a better description) but once the same term was applied to much of the coal now used at public generating stations for which the average pithead price is 16s. per ton. If collieries were entirely electrified and consumed 5,500 million kWh generated in base load stations on sites with ample water supplies they would need less than a quarter of the present amount of coal for producing the power. This wide margin between the two would alone provide warrant enough for the views expressed by Mr. R. Nelson (the first Electrical Inspector of Mines) in his I.E.E. paper regarding a wider measure of co-operation between the electricity supply and coal industries. It should surely be possible for each industry to obtain from the other more favourable terms and more stable conditions than now exist to the detriment of everybody.

Hull and the I.M.E.A.

AN unfortunate impasse has arisen between the Hull Corporation and the Incorporated Municipal Electrical Association. When Mr. J. N. Waite left Hull to join the Central Board a short time ago his place as general manager of the undertaking was taken by Mr. D. Bellamy while Mr. C. I. Shuttleworth was appointed chief engineer. The Electricity Committee desired to appoint Mr. Bellamy as one of its representatives in the I.M.E.A. but the Association pointed out that its articles of association required the "official" representative to be the engineer of the undertaking. Thereupon the Committee said that unless the Association was prepared to alter its articles to make the general manager eligible for appointment it would withdraw from membership. The I.M.E.A. replied that this could not be done and so the Committee decided to implement its threat and the Chairman even hinted that it was time that the undertakings formed a new "non-engineer" association. In our view both sides are acting contrary to their own interests. The I.M.E.A. cannot afford to lose a member so important as Hull and Hull cannot cut itself adrift from its confrères of the industry. The I.M.E.A. Council is meeting to-day, Friday, when the matter will be considered and, we hope, some way out will be found.

Fulham Extensions

WHEN the 60,000-kW set to be installed at the Fulham power station is running the total capacity of the station (which was started up in September, 1936) will reach 250,000 kW and will need only one similar set to bring it up to its designed capacity of 310,000 kW. Steam conditions at the boiler stop-valve will probably be the same as at present, viz., 625 lb. per sq. in. and 850 deg. F. The capital cost of the extension works out at £23.36 per kW compared with £21.87 for the first 190,000 kW, but the former figure is inflated by the inclusion of the foundations and other structural work required to complete the station. The figure of £21.87 per kW is itself high, however, as it includes among other special features the cost of sulphur elimination plant at £1.52 per kW. It is possible also that the estimate of £1,401,550 for the present extension will be increased by provisions for air raid protection, which added £0.263 per kW to the existing plant. While the capital expenditure on the station as a whole is relatively high, there are off-setting advantages in its site near the centre of load and also in low total works costs. Last January these came out at 0.1397d. per kWh with a coal consumption of 1.0137 lb. per kWh and an overall thermal efficiency of 26.26 per cent.

Scottish Water Power

HAVING examined the economic conditions in the Highlands and Islands of Scotland a Committee appointed in 1936 has come to the conclusion that one of the first duties of the Development Commissioner whose appointment is recommended would be a review of the industrial position in order to ascertain the extent to which utilisation of water power can assist in the general scheme. The Committee is not in favour of the transmission of such power mainly to southern areas. It is considered that the Government should guarantee loans covering the greater part of the expenditure, and that the rating of hydro-electric schemes should be brought into line with that of thermal stations. Simplification of the present expensive and involved procedure necessary for the promotion of water power schemes should receive consideration, a point made very apparent by the long-drawn-out and unsuccessful efforts of the British Oxygen Co. to secure authorisation for its Caledonian Water Power Scheme.

Sir Tom Callender

FEW representatives of British electrical industry were better known in the overseas markets than the late Sir Thomas Callender. For many years he made a regular practice of visiting India and various other parts of the world gathering business for his company by finding out the actual requirements of potential buyers and ensuring their production in the Callender works, simultaneously establishing a reputation for British-made cables. This aspect of a long and honourable career is referred to in our brief review of his activities on page 839. Sir Tom's death will be regretted not only by the staffs and shareholders of his companies everywhere, but by a large number of men in other lands who come into contact with him in the course of his travels.

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33-kV Switching at Brimsdown

By J. M. Goodall, M.I.E.E.

The main 33-kV switchgear of the Northmet Company at Brimsdown is divided into three groups, each of which at the time of its installation was the first of its type in this country. In the following article the author deals more particularly with the new bank of gear commissioned this year, after briefly describing the earlier installations.

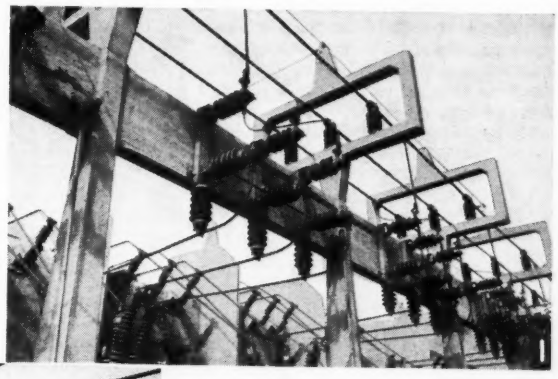
CONSIDERABLE pioneering work has been carried out by the Northmet Co., which in 1937 sold more than 690 million kWh to some 375,000 consumers in an area of about 670 sq. miles, included in which are: Power-factor correction by static condensers; the Ljungström turbine; frequency control (enabling electric clocks to be connected); generation at 33 kV; and Loeffler boilers operating at 2,000 lb. per sq. in., and 950 deg. F.

The Company has two generating stations at Brimsdown, Middlesex, and a smaller one at Taylors Lane, Willesden. The generating plant at Brimsdown "B" includes four 25,000-kW sets, three generating at 33 kV and one at 11 kV. This year a 50,000-kW composite set has been installed in the original "A" station, raising the total capacity of 33-kV alternators to 125,000 kW.

The original main network is operated at 11 kV, the primary 33-kV network having been initiated in 1926 and energised from alternators wound for this voltage. The 33-kV network is interconnected with the grid at a local C.E.B. substation, through 33/132-kV transformers.

The main 33-kV switchgear is divided into three groups. Group 1 was supplied by Ferguson Pailin in 1926 and is of the open type, outdoor form, carried on a reinforced concrete raft some 150 ft. long by 70 ft. wide. Circuit-breakers and transformers occupy open bays along both of the long sides, the duplicate bus-bars, isolating switches and connections being supported on the superstructure, 20 ft. above ground level.

The main bus-bars run along the middle of the superstructure on inverted post insulators. A concrete roof, floor and party walls form at once a working platform and protective screen around them. The auxiliary bus-bars occupy the same position in plan, and are carried by post insulators mounted on concrete beams on the roof of the main bus-bar gallery. The bus-bars are of circular hard-drawn copper bar. The main bus-bars are sectionalised in the centre by an isolating switch, and the two systems are coupled by an oil circuit-breaker. This layout economises floor space and lends itself to the compact symmetrical arrangement of branch circuits. The oil circuit-breakers, rated at 1,000 MVA, are of the same type as those installed later in Group 3.



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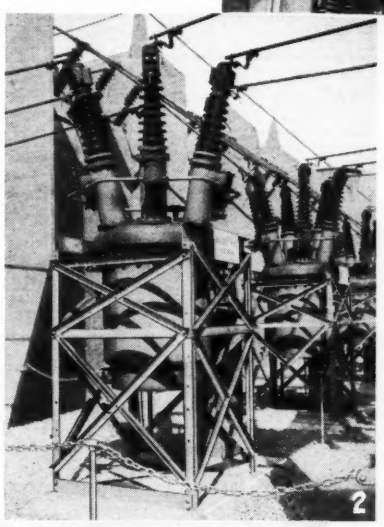

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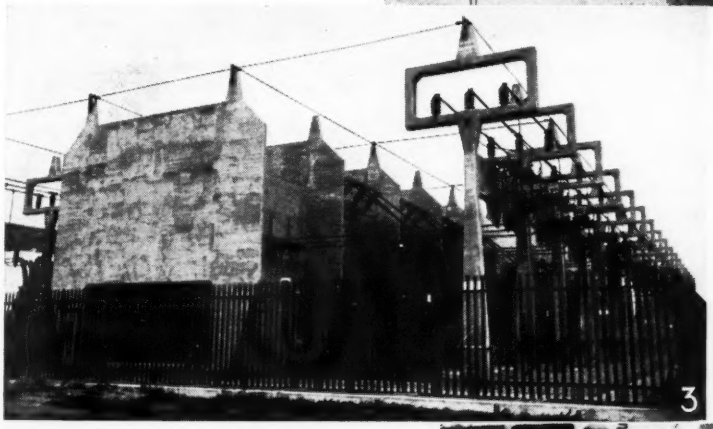

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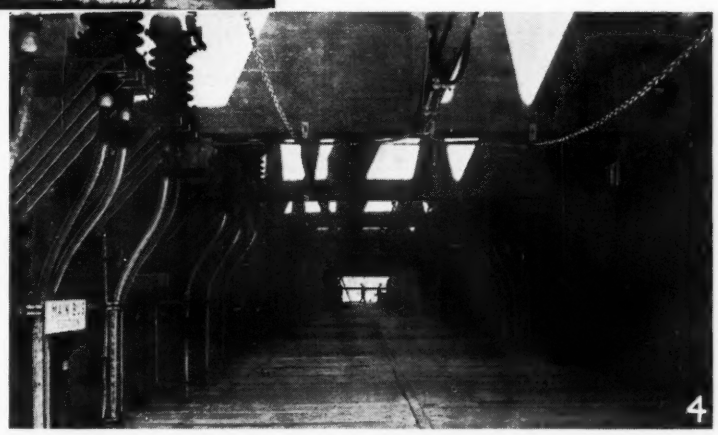
Main and feeder isolating switches are provided on each side of the oil circuit-breakers, which are normally connected to one bus-bar. Auxiliary and by-pass isolating switches are also provided for the second bus-bar, which permit of feeders being supplied from either bus-bar through their appropriate oil circuit-breakers, or, alternatively, one feeder may be supplied from one bus-bar *via* the bus-coupler oil circuit-breaker, leaving its breaker isolated for maintenance purposes.

All isolating switches are of the rotary type, mounted on the main superstructure, and wheel operated from ground level through bevel-gear drives. Switches for feeder earthing are interlocked to prevent their being closed when the associated line isolator and by-pass switches are closed. Interconnections throughout are of tubular section, and all conductors are carried on post insulators of the "fog" pattern, suitable for a working voltage of 44 kV to cater for the difficult atmospheric conditions obtaining at site.

Metal-clad protective and metering current transformers are carried on the superstructure. Two single-phase potential transformers per circuit are used where required. These are mounted on concrete plinths at ground level, and connected into circuit through hook-operated isolating switches, fuses and limiting resistances. Secondary cables are run in



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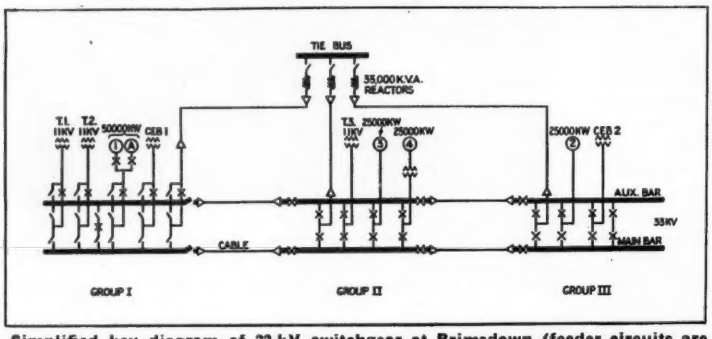
Views of the new switchgear at Brimsdown: 1. Bus-bar isolating switch (open). 2. Typical 1,000,000-kVA, 33-kV circuit-breaker. 3. General view from west side. 4. The centre aisle

special trenches which have been formed in the concrete raft.

The control board is housed in the "B" power station building, and is equipped with a mimic diagram with electrically operated semaphores indicating the position of oil circuit-breakers and isolating switches.

In 1930 when further 33-kV switchgear was needed, site limitations precluded the extension of the first installation and the adoption of gear of the same form. It was therefore decided to install armourclad outdoor switchgear for Group 2 of the type that had been put down at the State Line generating station of the Public Service Co. of Illinois. The metal-enclosed, isolated-phase, oil-filled design adopted has duplicate bus-bars mounted at opposite sides of the gear and duplicate plugging-type oil circuit-breakers.

The bus-bars, comprising paper-insulated conductors enclosed in copper sheaths and arranged as units, terminate in junction-box plugging chambers, which contain the current transformers, and have socket orifices for the voltage transformers. The circuit-breakers are plugged vertically into these chambers, a motor-operated carriage being provided for raising and lowering. The breakers were originally of the plain-break type, but are now being fitted with a B.T.H. self-compensated arc-control device as on the breakers for Group 3. Valves on the conservators enable a chamber on any phase to be drained. A separate metal enclosure for each phase maintains phase isolation with single-core outgoing cables running to an external trifurcating box.



Simplified key diagram of 33-kV switchgear at Brimsdown (feeder circuits are not shown)

Results of a Mishap

A somewhat serious (but unexplained) explosion and fire occurred on this gear in September, 1935. This put one set of bus-bars out of commission for a considerable period, but the second set was put back into service in two or three days, thus justifying the physical separation of the bus-bars, and the provision of duplicate breakers on each circuit. After the mishap it was deemed desirable to supply conditioned air to the annular space between the main plug and socket insulators in order to prevent condensation following sudden changes in temperature. A silica-gel equipment, by means of which filtered air having a humidity not exceeding 10 per cent. is blown into the sockets under slight pressure, has proved effective in preventing condensation.

Experience with the two forms of switchgear described indicates that where space is available at reasonable cost, the open type outdoor form has undoubted merits from the standpoint of cost and oil fire or explosion hazards, and it was consequently adopted for the latest Group 3 switchgear.

This gear has duplicate bus-bars and oil circuit-breakers, and each set of bars with its associated breakers is separated at the centre by a reinforced concrete aisle which comprises two parallel longitudinal walls 21 ft. 6 in. high, 6 in. thick and 17 ft. apart. This forms an effective fire barrier so that one set of bars and its breakers can be regarded as a genuine standby to the other. Such an arrangement complies with the recommendations in the Electricity Commissioners' Memorandum on "Fire Risks at Generation Stations" and with Air Raid Precautions Memorandum No. C.2, where a minimum of 5 in. thickness of concrete is advocated to resist incendiary bombs.

In addition to acting as a fire division, the aisle has transverse partitions which extend to within 8 ft. of the ground forming compartments which accommodate the breaker-selection and circuit-isolating switches and also the cable sealing ends, thus providing circuit separation. Moreover, with a circuit in commission on, say, the main bus-bars, its auxiliary bus-bar breaker is screened by the wall of the aisle from the live circuit connections, and similarly for the main bus-bar and its breakers.

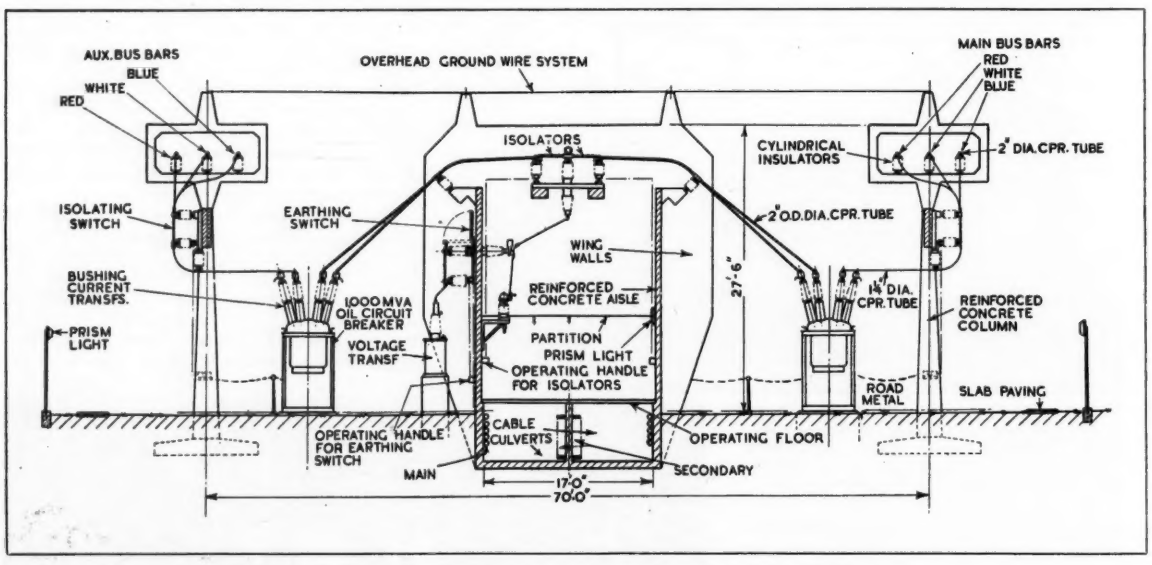
Potential transformers are fitted to alternate sides of the concrete aisle, this providing twice the bay centre dimension between transformers, a distance of 32 ft.

The base of the aisle forms a cable culvert, divided by a centre wall. As one half of the cables in each section can be brought out at either end of the structure, the cables can be divided into four distinct groups with alternate circuits run in different halves of the culvert and surrounded with sand or shingle. The culvert is covered by reinforced concrete planks, which form an operating floor for the circuit-isolating switches.

Tubular Bus-bars

The bus-bars are of 2,000 A capacity at 3-ft. centres, and consist of 2 in. dia. copper tube carried on cylindrical porcelain insulators, supported from a reinforced concrete frame at the head of a concrete column. The bars are built up in lengths corresponding to the bay centres, *viz.*, 16 ft., thermal expansion and contraction being provided for by fixing one end of each length and allowing the other end to slide in a stirrup, with a flexible jumper to the next length.

The interconnections consist of 2-in. or 1½-in. dia. copper tube, according to their length. The tubes are attached by mechanical connectors having hinge or expansion features where necessary to prevent windage or thermal movement imposing stresses on the supporting insulators or on the circuit-breaker bushings.

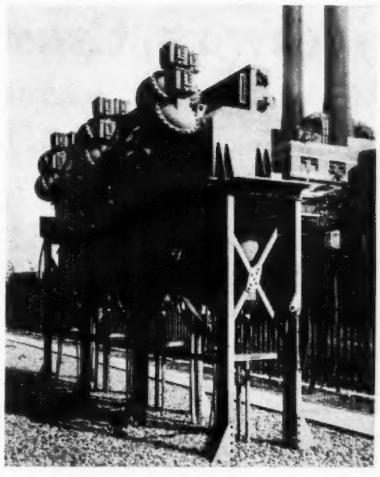


Typical assembly of generator, feeder, reactor and transformer equipments

As the pulverised fuel boilers and cooling towers under certain conditions cause damp dust to be deposited and as the site adjoins one of the Metropolitan Water Board's largest reservoirs, atmospheric conditions are difficult.

Various types of insulator were exposed on the site for six to twelve weeks in vertical, 45 deg. to the vertical, and horizontal positions, and then slightly moistened and tested for flash-over. As the result of these tests cylindrical insulators known on the Continent as the "motor" type were chosen, as these require cleaning at less frequent intervals than other types and, in addition, have the important advantage that all hardware is external to the porcelain. The pedestal insulators employed have a dry flash-over of 200 kV, a wet flash-over of 145 kV and an impulse strength of 296 kV on a 1 × 50 micro-sec. wave.

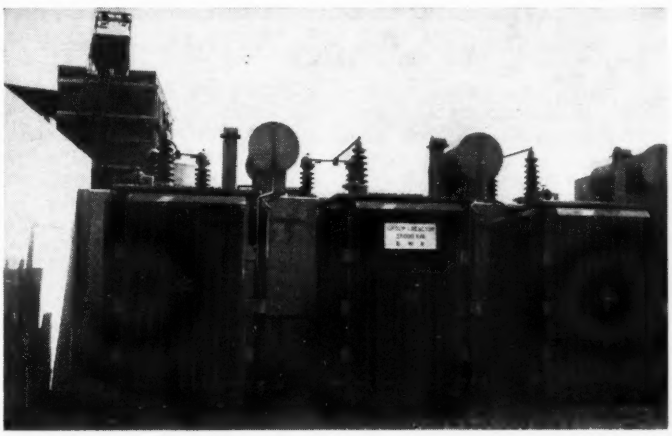
Circuit-breaker bushings are oil-filled, with a corresponding insulation level and fitted with arcing horns to prevent cascading. The porcelains are of the clamp type, in which the porcelain flanges are subject to compression stresses only, as distinct from the cementing-ring construction where the fixing arrangements impose shear stresses.



Reactor tie-bar isolating switches

Isolating switches are of the single-break rotating-blade type, the blade moving in a direction at 90 deg. to the axis of the insulator. This type was chosen by reason of its mechanical simplicity, the fact that in the open position the blade does not add to the projection of the switch, and the relatively high impulse strength of one single break, as compared with two equivalent breaks in series as on a centre rotating-post isolator.

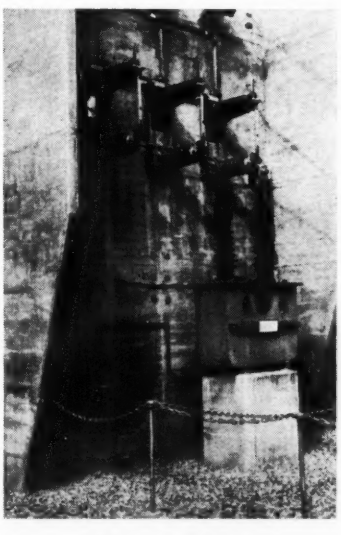
The cylindrical insulator chosen is particularly suitable for a rotational movement, owing to its large diameter and therefore high torsional strength. All switches are three-phase, gang-operated through intermediate rods, and an operating handle situated at ground level. Castell key interlocks ensure that load cannot be made or broken on an isolating switch, and auxiliary switches give remote electrical indication of position. Both clip contacts of the circuit switches are carried by an oil-filled bushing, the lower end of which is connected to the cable sealing ends.



Bus-section reactors

The circuit-breakers have all three phases in one round tank, oil-filled bushings, are framework mounted and have a rupturing capacity rating of 1,000,000 kVA at 33 kV to B.S.S. 116/1937.

Tests at 100, 60, 30 and 10 per cent. rating gave a total break time of less than 5.0 cycles down to 30 per cent. of its rating. An arc-control device of the B.T.H. Co.'s self-compensated type is fitted.



Voltage transformer

A common three-phase tank was chosen to obtain the minimum oil content, and also for convenience in lowering and raising. The breakers are DC-solenoid operated, and like the isolating switch mechanisms are fitted with cam-operated mercury auxiliary switches for the control and indicating circuits.

Circuit-breaker bushings are fitted with bushing transformers for the operation of instruments, relays and protective gear, and transformers on the duplicate breakers are permanently coupled in parallel. This arrangement eliminates switching on the secondary circuits, and does not affect accuracy, as the impedance of an idle transformer secondary is high, relative to the secondary burden.

Voltage transformers are connected to the terminals of the cable box through gang-operated isolating switches, the clip contacts of which are carried by oil-filled bushings passing through the wall of the aisle, thus removing oil-fire hazard from the aisle.

Protection against direct lightning strokes is obtained by a network of overhead ground wires. The earth conductors of 7/0.160 galvanised-steel wire carried on pinnacles at the top of the reinforced-concrete structures forming the busbar frames and the centre aisle.

Provisions for safe maintenance include:—

(i) Section clearances of 9 ft. where access is necessary to insulators.

(ii) Earthed ends of circuit-breaker, voltage-transformer and cable-box bushings are a minimum of 9 ft. above ground level.

(iii) Chains on 3 ft. concrete posts between bays and in front of each circuit-breaker which may be lowered only by an authorised officer.

(iv) Chains 8 ft. above ground level stretched between the transverse dividing walls in the aisle.

(v) Conductors between circuit-breakers and isolating switches supported by intermediate porcelain insulators carried on angle brackets from the wall of the aisle. These supporting insulators may be cleaned in safety, as the aisle is provided with 3 ft. wide wing walls between each circuit.

An earth bar is run along the inside of each wall of the aisle and connected with every fourth circuit-breaker bay to driven pipes coupled to the circulating water system of the station *via* the sheaths of the main interconnecting cables.

Tie bar reactors between the switchgear groups by the Fuller Electrical & Manufacturing Co., Ltd., are designed to give a reactance of 1,665 V per phase at a current of 612 A and to withstand a short-circuit current of 5,250 A for three seconds. They are of the single-phase circular coil, iron-clad coreless type in tubular boiler-plate tanks. The windings are of the continuous disc type, wound with paper-insulated conductors in parallel, on a bakelite cylinder with spacers to allow for free oil circulation.

Protective gear chosen comprised: Generators, Merz Price (and earth leakage No. 3 machine only); grid transformers, restricted earth leakage and standby overload and earth leakage; tie-transformers to 11 kV, bus-sections and bus-section reactors, Merz Price and standby overload; feeders, B.T.H. self-compensated pilot wire, Reyrolle "Solkor"; tie bus-bars, frame-to-ground earth leakage; bus-bar zone on all main switchgear, Reyrolle "Dualock" (provisional).

The operating and tripping supply for four oil circuit-breakers is treated as a section, and each section is supplied through an independent cable from weatherproof distribution boxes. This divides the control circuits on Groups 1, 2, 3, switchgear into ten sections, so that a fire should affect, at the most, two sections. The control board is also sectionalised. The major precaution against fire is to cover the switchgear site 4 to 5 in. deep with 2-in. road metal.

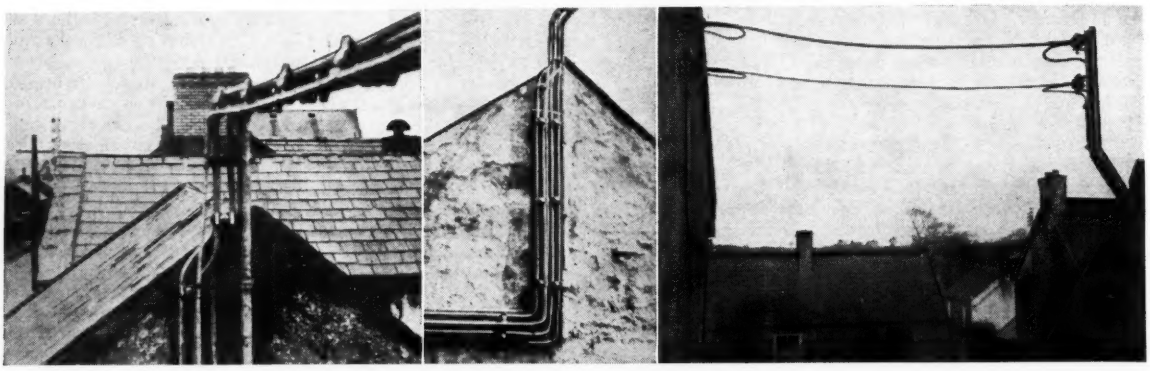
The arrangement and layout of the switchgear is due to Capt. Donaldson, assisted by Mr. A. H. Jenkins, and his staff. The component parts of Group 3 switchgear were designed and manufactured by the B.T.H. Co., the erection work being carried out by the Northmet Co. The concrete structure was designed and erected by Bierrum & Partners, Ltd.

Carriageway Crossings

By John McCombe, Ph.D., A.R.T.C., A.M.I.E.E.

An improved method for undereave low-voltage distribution

IN rural towns distribution in the principal and side streets is usually carried out by means of "undereaves" or surface wiring. These streets may have carriageways at short distances to give access to the back of the buildings, while side streets branch off at regular intervals. Methods have to be adopted for continuing the undereaves distributors across these open-

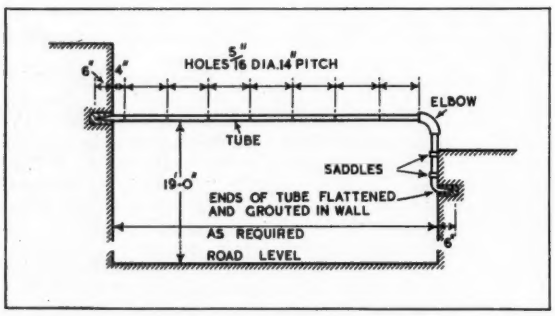


General and detailed views of the improved crossing with (right) a single-phase arrangement with wall bracket

ings to the adjacent building. This is comparatively simple if the buildings are sufficiently high to accommodate the crossing and maintain the statutory clearance of 19 ft. from the roadway to the lowest conductor.

Unfortunately one or both of the buildings is often too low to permit of a standard crossing and other means have to be employed. The common method is to use a wall bracket, but this is ugly and expensive and in bad walls a continual source of trouble. The wall bracket is usually of 4 by 2 in. channel iron, about 6 ft. long, held in position by three rag bolts cemented into the wall and drilled appropriately. Five D-irons, each carrying a shackle insulator, are bolted to the wall bracket and the three conductors, neutral and switch wire are made off to the insulators. Five parallel groove clamps are required for connecting the crossing to the distributors. Although general practice, this type of crossing is expensive. Furthermore, labour costs are high as rag bolts have to be grouted into the walls, conductors have to be tensioned and made off on the five insulators, the parallel groove clamps and conductor ends have to be carefully insulated, while in a poor wall the conductors have to be left comparatively slack in case the building is damaged or the bracket pulled out of the vertical. Where the buildings on both sides of the carriageway are low and where a wall bracket is required on each side of the crossing the cost would be in the region of £5 5s.

An improved type of carriageway crossing, which meets the case in which one of the buildings is too low, but is equally applicable where both buildings are low, can be constructed as



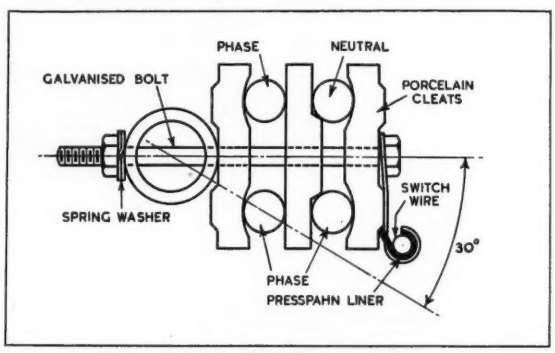
Improved type carriageway crossing

Tube 1¼ in. outside dia. for spans up to 15 ft., 1½ in. for spans over 15 ft. Height 19 ft. above road level

follows:—A 1¼ in. diameter steel tube, drilled at 14 in. pitch with 5/16 in. holes to take the cleat bolts, is used to make the crossing. The tube is cemented into the wall and the end is flattened to prevent turning. If the span is over 15 ft. in length a 1½ in. tube is used to minimise the deflection.

On the opposite wall saddles are fitted to hold the necessary length of the same diameter tube in a vertical position. The saddles are fixed to the wall by 2½ by ¼ in. coach screws which are screwed into No. 14 Rawlplugs. An elbow bend is screwed to the end of the tube making the crossing and the short length of vertical tube is in turn screwed into the elbow bend. A hole is jumped into the wall to accommodate the flattened end of the vertical tube, the supporting saddles being screwed tight and the flattened end of the short tube bent into the jumped hole and cemented in. When measuring the short length of tube great care should be exercised in order that the crossing may be truly horizontal.

Before erecting the tube to support the crossing the bolts, complete with cleats, should be fitted. The conductors are



Method of supporting conductors

then carried across the tube in double bank. If a switch wire is necessary a small hanger with presspahn liner is hooked on to the head of the bolt supporting the cleats. The cost of such a crossing is in the region of 25s. No cutting, making off or insulating of conductor joints is necessary as the conductors are continuous. These are carried up the short length of tube on cleats, across the long length of tube by the same method and continue down the opposite wall in the usual way.

Advantages of the method advocated are its pleasant appearance, low labour and material costs, and low maintenance charges. Moreover the conductors all cross at same level, and a minimum height of 19 ft. can accordingly be adopted. With wall brackets the lowest conductor has to be 19 ft. and provision has to be made for running the other four above this level. There is no cutting of conductors and no make off; hence, insulated joints with frequent renewal of tape are eliminated. Less difficulty is experienced in obtaining owner's and occupier's consents than with wall brackets and claims for damage are avoided.

Home Lighting Advisors

The first course for women to be trained as home lighting advisers was held at the Lighting Service Bureau recently. This was organised at the request of Edmundsons Electricity Corporation, Ltd., and planned with the idea of giving the twenty saleswomen present an all-round knowledge of lighting.

Electricity as an Aid to Farming

By W. Fletcher Cooper, A.M.I.E.E.

AGRICULTURE, our oldest industry, is still a long way from enjoying the many benefits which electricity, one of our youngest industries, can confer. There are many reasons for this, and a careful consideration of the difficulties existing on both sides may do something to bring about a closer co-operation between the two. The obstacles the supply engineer meets in trying to get a supply to the farm are almost too well known to repeat, the principal one being the comparatively large cost of tapping a high-voltage line in order to give a small supply. One is, therefore, faced with the question: can this small supply be expanded into a load larger and financially more worth while?

The supply engineer should realise at the outset that the average farmer is both cautious and conservative. As a general rule, he is slow to adopt new ideas, and requires a great deal of convincing before he agrees to scrap some method of doing a job which his father and grandfather have used before him. In this respect he differs widely from the townsman, who accustoms himself much more easily to changes of a radical nature.

One of the principal obstacles to rural electrification is the farmer's lack of knowledge of the benefits to be derived from it. The author stresses the need for closer contact between electricity suppliers, manufacturers and retailers on the one hand and the farmer on the other. The vital question of cost is also dealt with.

In order to cover the financial side, many undertakings adopt the guarantee system for the initial capital expenditure, whereby an annual guarantee is made by the farmer for the first few years of supply. If the farmer consumes energy to the value of this guaranteed amount, then all is well. But, should he consume less, the difference between the total of his bills for the year and the guarantee is made up as a cash contribution. This system is an equitable one, and has enabled many farms to have electricity which otherwise would have been unable to do so if a large cash contribution (additional to the charge for electricity consumed) had been imposed. But the scheme is unsatisfactory if the farmer is not sufficiently enterprising to install sufficient apparatus at the start to ensure that he consumes enough electricity to cover the guaranteed amount. It is in such cases that an energetic representative of the supply authority can be of invaluable help to the farmer.

One farmer who had read an article of mine, published in one of the agricultural papers, on the subject of getting electricity supply to the farm, wrote: "To connect my house with the mains would cost £70. It would be nice to have one or two lights in the house, but I am not so interested in power equipment. So I suppose the farm must do without it!" Here we come up against the old, pernicious business of "a few lights," but if the supply authority had translated the capital contribution of £70 into a guarantee, the possibilities are that the farmer would have accepted such terms and would have felt compelled to install sufficient apparatus to consume the units to which he would have been entitled under the guaranteed amount. Once the apparatus is installed, it generally stays for good.

The old sheep-shearing machine, still very widely used, requires a man to provide the motive power. His wages would soon buy an electric sheep shearer, one of which is seen in use at an agricultural show in the right-hand illustration

Another wrote differently: "There are overhead lines of 33,000 volts passing within three hundred yards of my farm buildings. Should it be possible, in this case, to have a supply? I should require the electricity for all domestic purposes, and in the buildings for lighting, milking, and power." Here is a farm where a supply, at reasonable terms, should be possible, and which should prove a satisfactory connection both for supplier and farmer.

A farmer who is a prominent member of the National Farmers' Union in the district in which he lives, has suggested to me that supplies to farms involving a capital expenditure to the supply authority of, say, £50 and upwards, might be met by means of a loan through the Ministry of Agriculture. The money would be lent to the farmer, who would repay interest and sinking fund spread over a long period. This would undoubtedly assist many prospective agricultural consumers who cannot see their way to manage the initial payment of a large capital sum, but who would be prepared to undertake an obligation of the kind suggested, over a period of several years. Perhaps some of those Members of Parliament who make a speciality of agricultural matters might be persuaded to pursue this idea further, as the scheme possesses many commendable points.

The farmer can frequently be helped by his electrical contractor in the question of installation. Once again, it is necessary to combat the view that the minimum amount of wiring should be installed, on the assumption that extensions can easily be made if, and when, desired. While, in many cases, such a course can be followed economically, yet it often happens that a little forethought at the start can be instrumental in saving a good deal of hard cash in the future. If the contractor does not point this out, the farmer is very liable to decide not to spend the extra money and useful additional load may be lost as a consequence. The contractor should do all in his power to assist the farmer to look well ahead, for the latter usually has only the haziest idea of the types of apparatus available for his different processes on the farm.

The contractor would be advised to bring to the farmer's notice the many advantages of a portable electric motor, which can be used for jobs such as hay elevators and saw benches, which are frequently some distance apart. I was in conversation with a farmer only a few days ago who was completely unaware that such a thing as a portable motor existed, although one of his immediate neighbours has had such a motor for the last two years. He appreciated immediately how useful such a piece of power apparatus could be, and is ordering one at once. Such motors require the provision of one or two power plug points (preferably three-phase, if available) at strategic positions in the farm buildings. The absence of such points in an existing installation may easily be a serious deterrent to the prospective purchaser.

The incident of the farmer who had not heard of portable electric motors raises the question of the efficiency, or otherwise, of the connection between the farmer and the retailer of electrical apparatus for agricultural purposes. In many cases, no direct connection exists at all. The farmer sometimes makes his acquaintance with apparatus new to him when he sees it in operation on a neighbour's farm. This system does not lend itself to rapid development. The shops which deal exclusively in farm machinery do not yet appear to have become electrically minded. Not only do they fail to stock electrical gear, but, as often as not, cannot advise the farmer on such matters. It would appear that considerable scope exists in this direction for the manufacturers to acquaint such firms with the details of their products, and to persuade them to stock certain pieces of apparatus likely to be of interest to the farmers in their district.

The following instance may serve to convince the doubtful that the preceding paragraph is not based on supposition, but on fact. A farmer, with whom I am well acquainted, called

at a large agricultural retail shop in his nearest town (the county town of an extensive agricultural area) to make inquiries about the purchase of an electrical sterilising equipment. He was not able to get any information at the shop either as to price or type, and a most determined effort was made to sell a coal-fired steriliser instead. The farmer was determined to have the electrical system and, in the end, he managed to get fixed up with some apparatus made for him by a small firm of engineers in the locality. Another farmer, wishing to purchase a 10-HP motor for farm purposes, had to overcome considerable opposition from the retailer of agricultural machinery, who was very anxious to sell him a Diesel engine. Nobody will deny that there is something fundamentally wrong when such an attitude is adopted over the sale of electrical apparatus.

The question of sterilising is one well worthy of consideration. A farmer can only be designated as a producer of Grade A milk if he possesses suitable sterilising equipment for his milking buckets, cooler, &c. This involves the use of steam-raising gear and, if done electrically, constitutes a load of approximately 7 kW for a period varying from an hour, to an hour and a half. Such a load can easily account for 3,500 kWh per annum and, as most sterilising is done in the early morning, is an off-peak load. The price of apparatus has been reduced considerably in the last few years, but there still seems to be scope for further reduction in order to popularise the electrical method, which is useful both to electricity supplier and farmer alike.

The farmer's wife is often potentially as good a consumer as her husband: in some cases, she is better. The boon of electricity for domestic purposes is more appreciated in the country than in the town, and any attempt to develop the farm load without giving careful attention to the farmhouse also, will neglect an outlet for a considerable number of units. Most farmhouses are large, rambling buildings and the farmer's wife has to work very hard with household tasks, quite apart from such external duties as looking after the poultry, which generally come under her supervision. Her difficulties are considerably aggravated by the fact that domestic help in the country becomes increasingly difficult to obtain. The attractions of the town, with its shops and cinemas, make domestic servants very dissatisfied with country service, especially during the winter. Add to this the extended hours most farmhouses have to keep, and it is not difficult to appreciate how the many advantages which electricity has to offer can help to ameliorate such conditions.

Water heating is one of the most useful services for the domestic side of the farm. Hot water is frequently required in large quantities at all times of the day, and the storage heater is ideal for this work. Many farmhouses are equipped only with water heating from the kitchen range, equipment which, in many cases, is very old-fashioned and heavy on fuel. Electrical apparatus for laundry work has a special appeal to the farmer's wife. The quantity of washing in a farm household is often much greater than that which the town housewife has to deal with, and a definite market exists for electric washing machines. Electric cookers, and the smaller current-consuming items such as radio sets and vacuum cleaners, are all particularly valuable on the farm. The domestic side of the farm load has been particularly stressed. It is necessary that the farmer's wife should be made familiar with the many labour-saving devices available. This may entail some extra publicity, for she is less in touch with these things than is her sister in the town.

In order to give the farmer the fullest assistance, one arrives at the following conclusions:—

1. If a heavy capital cost is involved in giving a supply to a farm, some reasonable system of payment should be made which is not prohibitive.
2. The farmer should be educated in the many uses to which he can put his supply. Do not wait years for him to make these discoveries himself; bring them to his notice as early as possible.
3. Do not neglect the farm's domestic load. This can easily be of a considerable size.
4. See that adequate wiring is installed at the start. The farmer needs particular assistance in this matter.

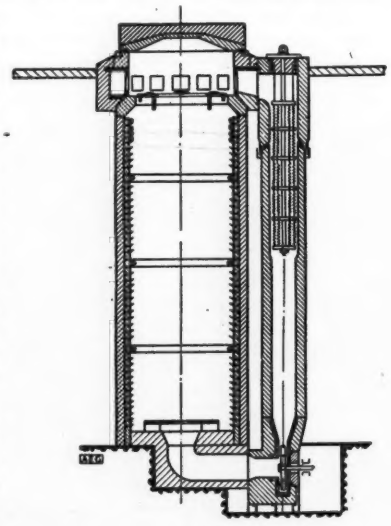
The potential farm load in this country is a large one. But, if a defeatist attitude is taken up by the supply authorities on the question of farm supplies, owing to the usual initial difficulties, then progress will be painfully slow.

Electric Resistance Furnaces.

By A. J. G. Smith

Design suitable for low and high temperature ranges

FOR the variety of different heat-treating processes involving temperatures up to about 950 deg. C., the requirements are such that in the past it has been customary for electric resistance furnaces for such work to be divided sharply into two classes. For the lower range of temperatures, up to about 650 deg. C., some form of fan and forced-air circulation system is essential for ensuring uniform temperature, whereas for the higher temperatures at which convected heat plays only a secondary role a type of furnace without forced circulation is necessary.



Section through 4 ft. by 14 ft. pit-type furnace

With the object of enabling a single furnace to be used for all processes involving temperatures up to 950 deg. C. a novel design has recently been developed by the A.E.G. concern. This is a vertical pit-type furnace the construction of which is indicated in the sectional view reproduced, showing a furnace having a working chamber 4 ft. in diameter by 14 ft. deep, with two separate systems of heating elements.

For processes falling within the lower range for which forced circulation is necessary the furnace works in conjunction with the heating shaft shown by the side of the working chamber. This shaft, which is 1 ft. in diameter, is provided with a series of withdrawable heating elements at the top and a forced circulation fan at the bottom by means of which the heated air is circulated with great velocity through the charge of work in the working chamber *via* the top and bottom flues.

For processes involving higher temperatures, up to 950 deg. C., communication with the side heating shaft is shut off by means of suitable dampers of special heat-resisting steel arranged in both top and bottom flues, and the furnace operates as an independent unit in the normal way without air circulation. The cover for the working chamber is hydraulically operated for opening and closing, and the rating of the furnace is 320 kW.

The Post Office Railway

THE Post Office (London) railway was the subject of the paper by Major W. G. Carter (G.P.O.) that was read before the Institution of Engineers and Shipbuilders in Scotland in Glasgow on December 6th.

The author described the various sections of equipment in some detail, including methods of operation, and the more important modifications made during the eleven years that the railway has been in operation, underground between P.O. premises and the chief railway stations north of the River Thames.

It was, he said, electrically operated, semi-automatically, the trains being driverless; it conveyed about 6.5 million letter bags and over four million parcel bags per annum. Its objects were to accelerate the transit time of mails between offices and to even out the flow of work in the sorting offices by dropping made-up bags through openings on to conveyors serving the platforms, so freeing valuable floor space. It also contributed to the relief of street traffic congestion which was a great problem.

International Telephone Conference

The Comité Consultatif International Teléphonique is holding a conference in London this week and next, representing fourteen countries. One committee is discussing disturbances which occur during long-distance telephone calls and the possibility of improving the transmision in other ways. Special attention is being given to faithfulness of voice reproduction on the telephone. A second committee is dealing with problems concerning the "carrier" system and is attempting to obtain European agreement on a standardised scheme.

House Wiring Methods.

By T. C. Gilbert, A.M.I.E.E.

Some suggested improvements

A LEADING article in a recent issue of the ELECTRICAL REVIEW stressed the need for improved wiring methods for domestic installations. As I have long held the view that many of our present methods and systems are indefensible from both the technical and economic standpoints, I am taking this opportunity to put forward suggestions for the alteration of methods that have held the field too long. At the same time, the object will be to provide better and safer installations in addition to reducing their cost, as any attempt to achieve the latter object without paying due attention to safety and service must inevitably fail.

It is doubtful if the palliatives suggested in the article, *i.e.*, single-circuit wiring for both heating and lighting and what is in effect a bus-bar box surrounding rooms, from which extensions might be easily and quickly made, would receive universal approval in the industry. My own experience is that the former practice causes a noticeable diminution of lighting when a 3-kW radiator is switched on and I can detect when the water-heater thermostat has come in by its effect upon my study lamp, which is wired on the same circuit. No other lamp in the house is affected, as they are on separate circuits.

In the author's opinion domestic installations could be carried out at a greatly reduced cost and yet be superior in convenience and safety to much more expensive systems. His recommendations include the provision of a simple ring main, looped from point to point, to supply all the power required for twelve heating points.

The bus-bar box idea has its own shortcomings, chiefly of cost, but also because modern houses, with their plain flat walls, do not lend themselves to the installation of a skirting box with a removable cover and extensions are more easily made from the floor. In addition to technical requirements, wiring systems have to meet the sometimes curious fads of architects, and it is doubtful if any mutilation of a wall or skirting would receive general approval —even if a skirting exists.

I am in full agreement that the present idea of good practice in taking every 15-A sub-circuit back to a separate fuseway is a costly burden on the householder, and it is not even technically beyond reproach. The long lengths of sub-main wiring, representing high cost in material and labour, are also responsible for loss of energy, while the load factor must represent some absurdly small value. For instance, in an installation comprising, say, twelve heating sockets, wiring is installed for a total capacity of 180 A; very rarely will the maximum demand exceed 30 A, and yet we do not feel safe in placing any two sockets on one fuseway. In addition to the 12-way 15-A distribution board, recognised practice usually demands a 60-A main switchfuse, whereas in most cases one of half this capacity will suffice.

Power Ring Main

I would suggest that the running of a simple ring main of, say, 7/.036 cable round the house, looped from point to point, would provide all the power required for twelve heating points, under normal conditions of usage. With a 30-A switchfuse to control this ring there should be little possibility of overloading, although in conditions of heavy use this could be increased to 60 A without great increase in cost. The protection of individual heaters or appliances should be afforded by means of local fuses in the plugs themselves—not the sockets, as this would prevent the immediate use of another device from the socket. In these days of standardised cartridge fuses and AC supplies the accommodation of one fuse in a 15-A plug calls for no great feat of design, which should, however, concentrate upon easy access to the fuse, permitting simple and safe replacement.

If this power circuit is a proper ring, returning the ends of the cable to the fuseboard from which it emanated, it is difficult to imagine conditions under which any form of overload would occur, while the estimated cost is only one half of the orthodox job, even including the fused plugs. Convenience is enhanced, as another device can be immediately plugged into the socket in the event of failure, without hunting for the blown fuse through the board, usually a matter for the electrician next day, anyway. The regulations will not approve this simple arrangement, however, as yet, although it is difficult to visualise serious objection to it.

Carrying this arrangement a step further, it should be possible to utilise the 15-A sockets for all purposes—if the small volt-drop objection for portable lamps be considered of no practical importance. That is to say, from each 15-A point it must be possible to take 5- and 2-A loads without the use of loose adaptors; all three sizes of plug must be suitable for insertion directly into the large socket, and each size of plug must carry its appropriate fuse. These plugs are already available, and one pattern of socket at present on the market will accommodate the three sizes of plug without adaptors. I am of the opinion that the three sizes, 15-, 5-, and 2-A plugs, should be retained, if only to ensure that the load is protected by the correct capacity of fuse, thus preventing damage to the appliance or lamp, which might occur if all plugs were of 15-A capacity.

Unfortunately, the only pattern of plug and socket that will afford this desirable service is of the flat-pin type, and therefore considered beyond the pale by the compilers of our regulations. My view is that our present insistence upon plugs and sockets to B.S.S. 546 must eventually go, as they do not secure the necessary degree of consumer-convenience. It is not a question as to which type of socket is best, and if the present round-pin pattern can be designed to accommodate 15-, 5-, and 2-A plugs without any form of adaptor, then no doubt the industry will accept it without criticism.

The placing of, say, four such sockets in each room on the ring-main system would permit the utmost convenience for heaters and other appliances or portable lamps at a cost no greater than the installation of one lighting socket and one heating socket; the potentiality for service is, however, quadrupled, and the utmost advantage is taken of the unique service provided by electricity supply. Heaters can be placed in any required position, and other loads taken simultaneously or alternatively from any point; with four general-purpose points instead of one lighting and one heating point, vacuum cleaner and standard lamp flexibles may be kept to a minimum length, thereby cutting out a prolific cause of damage and failure. The need for additional points should never arise, and if it did would not entail much beyond the cost of the socket and a short length of wiring.

Single or Three-phase?

A further point to be considered is whether this ring main should be three-phase where this would be of advantage. In my opinion insufficient use is made of three-phase supplies in domestic premises, whereas it seems to be common on the Continent. In many German installations motors as small as that of the radio-gramophone up to the type required for a washing machine are three-phase. Some advantages are freedom from radio interference and brushgear troubles while the reduction in cost would be reflected in the price of practically all motor-driven domestic appliances, especially if in the proposed legislation interference-suppression is enforced; maintenance costs would be practically eliminated. Lower costs would also be possible for wiring to consumers' specified demands.

It is the practice in Germany to connect a hot-plate across 380 V for a short period during initial heating, changing over to 220 V after about 80 seconds by means of simple automatic devices. The advantage to the supply authority in improved voltage regulation, especially in rural areas, and, indeed, full efficiency of any three-phase supply, cannot be enjoyed without three-phase application to all forms of common usage. Danger to the user is not increased, as the voltage to earth remains the same. On the other hand, it would be decidedly safer than our present practice of utilising two phases for different purposes, often in the same room, which has caused the Electricity Supply Regulations, 1937, to require all sockets in the same room to be on one phase, and the I.E.E. Regulations to demand that sockets on different phases shall be kept a specified distance apart. Even so, it is possible for the user to make contact simultaneously between the phases by reason of the flexible cords connected to such sockets, but with the utilisation of two or three phases in one appliance this risk would disappear, unless the user were in the habit of taking his appliances to pieces, in which case he runs an equal risk with a single-phase supply.

Would it be possible to use any such three-phase ring main for power, heating and lighting indiscriminately? I think that it would, depending on the design of the sockets, which would now become four-pin, with three phase pins and one neutral. Wiring would be smaller and terminals reduced accordingly; insulation would need careful attention, and there would be three phase fuses in each plug. Vacuum cleaners and similar appliances would tap the three phases and the neutral, which would also be the earth conductor. Radiators could be wired for three phases, with star-delta heat control, or for ordinary two-wire supply at the higher voltage; portable lamps would tap one phase and the earth/neutral. A common German arrangement might be preferred—a three-

phase power socket, with earth/neutral, placed alongside the smaller two-pin non-reversible socket, all wired from common mains and fitted with fused plugs.

By using the neutral as the earthing medium further economies become possible, as the neutral could be unfused all through the installation and the cost of fuseboards for the two-wire circuit at present in use would be cut almost in half. A rise in neutral voltage in the event of a fault could be guarded against by the connection of a leakage trip (isolating phases and neutral) between the earth/neutral and an independent electrode. Several trips could be used for selectivity, but I would suggest that for a small domestic installation, where earth faults are comparatively rare, especially if the wiring systems here recommended are employed, one leakage trip at the point of entry is sufficient. As under the recommended arrangement, each appliance and portable lamp is protected by its own correctly calibrated fuse, the incidence of short-circuit in itself or its flexible lead would not affect the neutral voltage, and even an earth fault could be cleared without sufficient voltage rise to affect the leakage trip. This again would depend upon earthing conditions, but the trip is easily replaceable by hand when the fault is removed.

Radio Interference Suppression

The question of three-phase domestic appliances receives greater emphasis by reason of the proposal to require interference-suppression devices as an integral part of all motor-driven equipment in the future. Apart from the possibility of increased cost and greater complication of apparatus that should be of as simple construction as possible if heavy maintenance costs are to be avoided, the proposal also introduces problems of a technical nature. In the Report of the Senior Electrical Inspector of Factories, 1937, it is stated that the use of condensers for interference suppression necessitates values that may result in slight shocks to persons using the appliances. The alternative seems to be the use of chokes in series with the line or the earthing leads; the latter arrangement has many advantages, particularly in cost and efficiency. Ordinary earthing of appliances, in general, increases their liability to cause interference.

A choke in the earthing lead, however, adds to its resistance, and so the windings must be large enough to carry any possible earth fault current, if isolation is to be effected under fault, and will also require considerable latitude in the total permissible resistance in the earth circuit. This is placed at one ohm by our present regulations, but total impedances of three or four ohms must be visualised if suppression is to be effective, which means that isolation under fault will not be possible in most cases. On the other hand, the overheating of chokes due to the continuance of fault current may cause fire, or damage to the appliance itself.

As an alternative to the use of three-phase for domestic supplies, all forms of solid earthing could be abandoned in favour of the earth-leakage circuit breaker, the trip coil of which incorporates a high-impedance choke in the earth circuit, without in any way vitiating the protection offered. Experiments clearly show its effectiveness in reducing or eliminating radio interference.

Fully half the cost of a well-designed domestic installation is represented by the heavy metal coverings of the circuit conductors, necessitated by our retention of the principle of leakage protection by means of heavy overload currents. These earth circuits may consist of conduits or lead sheaths, usually quite superfluous by reason of common domestic conditions, but entailing considerable (and expensive) attention in testing for continuity and low resistance. This additional cost prevents a certain amount of domestic development; in addition, this system is inflexible, since no alterations are possible without considerable disturbance to the building, which again proves costly, even if it does not of itself prevent more advantageous arrangements being made in the installation.

Solid Conductors

For the smaller domestic installations, say for houses up to £2,000 in value, I consider that all metal-clad forms of wiring should be abandoned. More flexible forms are already available in the form of tough-rubber and similar systems. Unfortunately, prejudice still exists regarding these simple systems, both within the industry and without, while amongst architects and some consultants the steel tube has become almost an obsession, no doubt fostered by the reverence in which it is held by the trade, although the conditions under which the steel tube installation exhibits its greatest value are non-existent in the domestic installation.

Assuming that the tough-rubber wiring represents the nearest approach to the ideal for the domestic installation, on the score of installation cost and flexibility, even the cost of this system could be reduced if another prejudice can be overcome—the greater use of solid conductors, referred to by Mr. Fennell in his recent address as chairman of an I.E.E. Centre. We alone among the great nations insist upon stranded conductors for our smaller wires and cables, another product of the tube complex, whereas most of the advantages appear to lie with the solid conductor. The larger cables must be stranded for convenience in handling, but up to 15-A capacity there seems no good reason why stranded conductors should be preferred. For conduit systems the use of solid conductors permits a greater number of wires per conduit; there is less elongation when drawing in, and therefore less stress upon the slightly stretched rubber insulation; there is less entry of moisture at the cut end, as the rubber insulation fits more closely over the conductor; there is also a slight advantage in cost. For lead-covered and tough-rubber systems the sole advantage possessed by the stranded conductor, flexibility, has no value.

Advantages of Tough-rubber Systems

In my view, therefore, the ideal domestic wiring system is most nearly approached by the tough-rubber system with solid conductors. In the present types, however, the earth conductors placed below the outer sheathing are too heavy, as they follow generally accepted practice—heavy currents to blow the fuse. Greater economy could be achieved with the reduction to, say, 1/.036 for all sizes of earth-continuity conductor whatever the size of the circuit conductor, as would be possible with the use of the earth-leakage circuit-breaker. With the general adoption of this method, and the installation of the power ring, the cost of domestic installations could be reduced by half, while they would remain superior in convenience and safety to those erected at much greater cost, at the same time practically solving the problem of radio interference from the commoner domestic appliances without increase in cost or complication.

Experience shows that tough-rubber systems have a longer life than lead-covered cables, while their mechanical protection must be considered superior to lead. Light-gauge conduits are not usually relied upon for good continuity after a few years, and even these are not proof against nails, in the hands of the householder. Moreover, if t.r.s. cable is damaged it can be more easily replaced or repaired. A number of tough-rubber installations, carried out about twenty-five years ago, have recently been examined, and appear to be as good as ever; if ever rewiring should become desirable, it will be easily carried out, as the installers had the good sense to provide light tubes down the walls to switch points, &c., which might be more widely practised to-day with advantage. It is reasonable to expect this form of wiring to outlast any other, as the absence of an earth-connected metal surrounding relieves the cables of stress, and there is nothing to encourage breakdown at any point, as in the case of lead-covered systems.

Extensions and alterations are simple with tough rubber, but costly and usually difficult with lead sheaths and conduit—often necessitating the pulling out of one or two points. If we *must* have pipes to put our conductors in, could not these be of non-metallic construction, as used on the Continent, with simple butt joints? Fire risks disappear with the elimination of the earthed metal surrounding and the heavy leakage current; a t.r.s. system with a small embedded and insulated earth conductor provides all the leakage protection necessary without introducing further complications of its own.

Installation Standards

One other matter will require attention before the full benefit of reduced costs can be felt—a national minimum code of wiring rules binding upon all and sundry. This should ensure standardised material and systems, and prevent the fungoid growth of local ideas and fads, which do far more to restrict development than is often suspected.

Whatever is cut down, however, and whatever margins are still further pared, nobody with any experience of installation work would advocate a lowering of the standard of the work. In the improved and rationalised installation of the future much more will be left to the good sense of the installer, necessitating training and experience, with less tramelling by regulations. The present move towards registration of the operative is therefore all in support of the better and safer installation, and with the complete removal of the half-trained and the dabbler from our midst we should be able to rely more upon common sense and less upon regulations. The real solution to the problem would seem to be—select and train your operative, and leave him to his own devices.

In the main these proposals for the betterment and cheapening of the domestic installation constitute a reversion to the tree-wiring systems of our forefathers, but with even greater subdivision of the fuse points. Lighting circuits may remain much as at present, as it is in the direction of the development of other uses and utility that revision of our methods is needed.

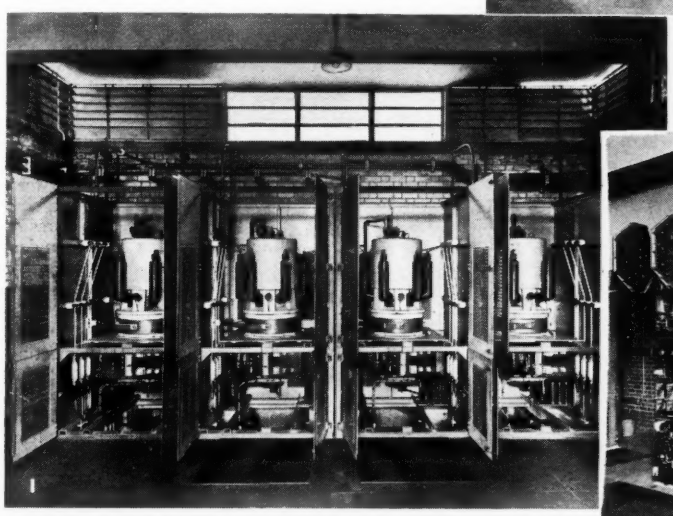
Trolley-Bus Sub-stations in London

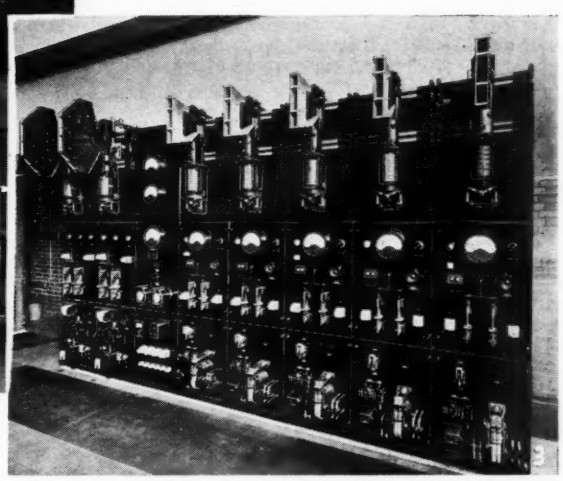
Pumpless air-cooled mercury-arc rectifiers employed

THE replacement of trams by trolley buses in the London area involves the conversion of 196 miles of route, of which more than half has been changed over. Approximately 400,000,000 passengers a year are now carried by London Transport trolley buses—a substantial increase over the number formerly carried by trams.

New sub-stations are necessary in order to deal with the heavier load due to the more rapid acceleration of trolley buses and the greater frequency of service, and secondly, to reduce the average distance between the points of supply (which was often three miles or more with trams) and thus maintain a more constant voltage. In some cases old sub-stations situated in tramway depots have been replaced by new ones elsewhere, thus enlarging the depot accommodation. The complete electrical equipment of twelve sub-stations (most of which are now in service) was entrusted to the General Electric Co., Ltd. Steelclad mercury-arc rectifiers of the G.E.C. pumpless air-cooled type with an aggregate capacity of 11,000 kW are installed.

Nine of these sub-stations serve five routes in the Walthamstow area, which run as far west as Tottenham Court Road and Parliament Hill Fields; in six of these with installed capacities of 750 and 1,500 kW are two twin-cylinder units, and in the other three, with installed capacities of 500 and 750 kW, two single-cylinder units. Two sub-stations, at Hammersmith and Putney Bridge, supply the Fulham-Wandsworth-Croydon route; the former contains two 500-kW twin-cylinder and the latter three 250-kW twin-cylinder rectifiers. In the remaining sub-station, at Garratt Lane in the Wandsworth area, are two 250-kW single-cylinder sets. The sub-stations are supplied with three-phase AC 33⅓ or 50 cycles at 6,600 or 11,000 V, and supply DC at 600 V to the trolley wires.





1. Two 375-kW units at the Blackhorse (Walthamstow) sub-station. 2. Forest Rd. (Walthamstow) sub-station. 3. 650-V DC switchboard at Hammersmith.

Equipment has been standardised throughout, except at Putney Bridge sub-station, where special features were incorporated due to the site conditions. This sub-station was the first in the world to include air-cooled steelclad pumpless rectifiers which have now been installed in other sub-stations.

The rectifier consists of a cylindrical main tank enclosed in cooling air ducting and supported by an insulating cylinder on the baseplate. A mercury pool at the bottom of the tank forms the DC positive pole. The main anodes are fitted in side arms, which are welded to the main tank and act as an anode shield to prevent backfires and as a radiating surface to dissipate heat (dispensing with anode radiators). The main anodes, auxiliary anodes, and the cathode and lead-in insulators are equipped with the patented G.E.C. vitreous seal. This seal consists of a number of thin mild-steel cones separately coated with vitreous enamel; after assembly the whole seal is fused up solid in an oven, giving mechanical strength, high dielectric strength and vacuum tightness. In the standard arrangement the rectifier cubicle contains also the cooling fan, fuse panels, surge arrestors, and isolating transformer mounted below the cylinder.

The high-voltage switchgear in most of the sub-stations consists of a standard 11-kV metal-clad switchboard, with an oil-immersed wing isolator for the incoming cables at each end. Between these are installed 150,000-kVA rectifier oil switches grouped on each side of a bus section switch.

The transformers are generally of the oil-immersed type, employing a six-phase delta double-star connection. A small smoothing choke is connected in the negative DC lead.

The DC supply is controlled on a flat-back switchboard, at one end of which are mounted the rectifier panels and at the other end from three to six track feeders. Between them is a metering and testing panel. All DC circuits are fitted with panel-mounted high-speed circuit-breakers on the positive pole and contactors on the negative pole.

The rectifier units are started by closing the oil circuit-breaker, which initiates an automatic sequence, resulting in the units being paralleled on the DC bus-bars. The feeder circuit-breakers are remotely controlled from pillars installed alongside the trolley-bus route. Normally the remote control switches are kept closed and the high-speed circuit-breakers are operated by auto-reclose relays, which reclose the feeders a number of times after a fault at predetermined time intervals, finally locking out the feeder if the fault does not clear itself. The lockout can be reset by remote control.

Summation inverse-time-limit overload relays trip all DC feeders if the total load exceeds the rectifier capacity, although individual feeders may take very heavy loads for short periods. After a shut down of this type the feeders reclose separately under the influence of relays with variable time delays.

As a result of the successful operation of the sub-stations London Transport Board has decided to employ similar G.E.C. rectifiers in a further twelve sub-stations on their railway extensions in North-East London.

Meetings and Discussions

An interesting discussion followed the presentation of Mr. R. Nelson's paper on "Electricity in Coal Mines" at last week's Institution meeting, in the course of which Mr. J. A. B. Horsley said that the status accorded to colliery electrical engineers could hardly be said to equal the skill and responsibility required of them. Equipment at the Alexandra Palace Television Station was described in two papers which were before the Wireless Section on Wednesday, and at an E.P.E.A. meeting last week cable-testing methods in America were discussed

Electricity and Coal Mining

VARIED aspects of the many uses to which electricity is put in coal mines were debated at the INSTITUTION OF ELECTRICAL ENGINEERS in London on December 1st. Mr. R. Nelson prefaced his paper (to which reference was made last week) with the statement that it was necessary from the safety point of view seriously to consider past happenings in order that history might be prevented from repeating itself.

Mr. W. B. Woodhouse opened the discussion by remarking that the author's work while he was Electrical Inspector of Mines, particularly with respect to regulations, had borne abundant fruit. He next paid tribute to Professor W. M. Thornton's splendid service to the industry and his courage in voicing dissatisfaction with what was at the time regarded as satisfactory.

Mr. Woodhouse considered that the author had not paid sufficient attention to power companies' efforts to encourage the use of electricity in mines; for example, in Yorkshire and on the North-east Coast. Some possible causes of explosions in mines had not been fully appreciated. The ease with which electrical apparatus could be tested caused it to be the first item to which attention was directed whenever anything happened. In that way suspicion might be caused where it was unwarranted. They must be on their guard against facile acceptance of electrical explanations of accidents which could not be justified.

Co-operation Beneficial

The advocacy of co-operation between electricity and coal producers was sound sense. It was not only desirable but also inevitable, and the gas industry would also play its part. Since the coal industry had become a quasi monopoly the outlook had been changing. Electricity and gas producers were no longer regarded as competitors, but were looked upon more as distributors of the heat and energy content of coal. There was definite co-operation between electricity and gas and coal industries in Yorkshire. The remarkable changes which had taken place in the price of coal now made it imperative for the most economical use to be made of raw coal. The term "unsaleable" coal was a misnomer, for in time even household coal might become unsaleable.

Professor W. M. Thornton associated himself with much of what Mr. Woodhouse had said and mentioned examples of progress in electrical mining. Each major explosion had caused improvements to be introduced which provided greater safety. The influence of the presence of gas on the ignition of coal dust by an electrical flash was not yet properly appreciated. Even 0.5 per cent. of gas might increase the danger and 1.5 per cent. of gas made an explosion almost certain. Some electrical device for testing the presence of 1.25 per cent. of gas was an urgent requirement, since the flame lamp detector had done its best and some better means was now required.

Most Accidents are Non-electrical

Mr. J. A. B. Horsley quoted statistics to show that the majority of accidents were not of electrical origin, but the miners' view that electricity introduced a greater hazard was understandable because a single electrical accident could harm large numbers of men. Among the major improvements more recently introduced were core-balanced leakage protection, screened cables, the application of remote control at the coal face, which meant direct-on starting, the employment of higher voltages underground and the replacement of fuses by circuit-breakers. All improvements of this sort called for more skill on the part of electricians and colliery electrical engineers, but the status accorded them could hardly be said to equal the skill and responsibility required of them. One of the most urgently needed improvements was some new form of fire-damp detector.

Mr. B. L. Metcalf discussed the purchase of power in bulk versus private generation. He said that the HP of motors installed was not a satisfactory yardstick with which to measure development, since one large motor driving a compressor on the surface might exceed in HP the total of many small machines employed underground. He quoted figures showing how a coalfield benefited when the whole of the electricity required was furnished by a single supply company.

The electric winder was a thoroughly satisfactory machine and safer than a steam winder. Nevertheless, the number of electric winders was not increasing appreciably, the reasons being that the maximum demand involved was not always within the capacity of the local supply authority, while the user would have to change his mixed pressure turbine plant when the steam winder exhaust was no longer available. He hoped the idea of creating fuel and power boards would be expanded. Could such a board be empowered to take over a colliery power station, burn the whole of the unsaleable fuel available and make up any deficiency with power transmitted from its main generating system?

The nature of an electrical inspector's duties was changing. He was now required in addition to be a consultant and to give advice in the case of new work. The tendency to regard inspectors as advisers and friends would be a material factor in the reduction of accidents.

Mr. A. R. Chaytor said that the use of 3,000 V underground would hardly suffice and that 6,600 V or even 11,000 V might be needed in future. From the electricity supplier's point of view the colliery load was a very good one. It began to fall away at about 2 p.m. and did not interfere with any peak or periods of maximum demand.

The author, in reply, explained that his suggestion that the grid had made electric winding possible to all collieries implied an emphasis on the word "all." He was well aware that the Y.E.P. and N.E.S. Companies had aways been able and willing to take on winding loads. He well remembered the price of coal on the north-east coast being 4s. 9d. a ton. There was good fuel and fuel, but there was no such thing as bad fuel. That should be their point of view. In South Wales there was already an interchange of electrical power between the electricity and coal producers and facilities of that kind would, he hoped, be further developed in future. He was of the opinion that 3,000 V was quite high enough for use underground.

Television Transmission

TWO papers were presented at the December 7th meeting in London of the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS. Both emanate from the research laboratories of Electric and Musical Industries, Ltd., and deal with the design of equipment employed at the B.B.C. television transmission station at the Alexandra Palace.

The first paper, by Messrs. E. C. Cork and J. L. Pawsey, is concerned with reflection phenomena in long feeders used to transmit (to the Marconi aerial) modulated high-frequency carrier waves, such as wide side-band television signals, in which the time of transmission of a wave along the feeder is comparable with the time periods of the modulation frequencies.

To avoid distortion of the transmitted picture, stringent impedance matching is necessary, since the time of travel of a wave along the feeder is not negligible compared with the time periods of the modulation frequencies. These conditions do not appear to have had much consideration. They are discussed in some detail in this paper, which shows that these reflecting irregularities may be studied in terms of the variation with frequencies of the input impedance of the terminated feeder. Their nature, magnitude and effect on a received television picture are indicated, and methods of reducing them are discussed. The vision aerial feeder system of the London television station is described, including the aerial-to-feeder matching arrangements and a device for reducing the residual mismatch due to the variation of the aerial impedance over the frequency range of the carrier and side-bands. Apparatus for measuring the input impedance and the methods adopted for establishing a standard resistance for terminating the feeder are described.

"Camera" Design

The second paper, by Drs. J. D. McGee and H. G. Lubszynski, describes the construction and mode of operation of television "cameras" of the cathode-ray class. Performance and limitations are compared to indicate the superiority of the latest "Super Emitron," brief reference being made to other types that have been tested experimentally.

The essence of the principle is that during part at least

of the picture-frame period the photo-electric emission due to the light from each picture point of the image is stored up as a charge on a mosaic of photo-electric cells, each associated with a condenser. The condensers are discharged in sequence by some switching mechanism such as a beam of electrons; the sequence of electrical pulses thus produced constitutes the "picture signal."

The efficiency of the ordinary "Emitron" is of the order of 5 per cent. of the theoretical maximum. The chief reason is lack of saturation of the photo-emission from the mosaic during most of the frame period. A less important reason is the spread of secondary electrons released by the scanning beam from the mosaic. These secondaries neutralise the charges stored on the mosaic elements and also generate spurious signals, such, for instance, as a lower frequency component known as "tilt" which is superimposed on the picture signals. The "tilt" may be corrected by suitable electrical circuits.

By separating the two functions of photo-emission and charge storage the efficiency of the latest type of "camera" has been improved. The normal photo-sensitivity has been limited to about 12 μA per lumen, but more than twice that value is now obtainable. Other features of the newer type of tube are improved optical conditions and multiplication of the charges on the mosaic by secondary emission. Thus, for equal photo-sensitiveness about 10 to 15 times the former signal amplitude is now obtainable.

This factor is too large to be explained in terms of secondary emission amplification alone; account must be taken of the different velocities of the photo-electric and secondary electrons. The velocity of the former corresponds approximately to one electron volt, whereas the bulk of the latter are released at several electron volts and a proportion of them have much higher velocities. Thus they escape more readily under the same field conditions and reach the second anode, so increasing the integrating efficiency, since a substantial number of electrons will be able to leave the elements between scans. This is confirmed by the observation that fast-moving objects imaged by the newer tubes leave a blurred trail behind them in the picture, the leading edge being sharp.

Sensitivity can be still further increased if the electron beam forming the picture is amplified more than once before reaching the mosaic. The newer "cameras" have been satisfactorily used by the B.B.C. when very little light is available or when telephoto lenses are necessary.

Television Practice

AT a recent meeting of the ENGLISH ELECTRIC CO. (STAFFORD WORKS) ENGINEERING SOCIETY, Mr. A. D. Sloan (chief engineer) presiding, 300 members listened to a lecture on television by Mr. A. B. Home (B.B.C. Research Dept.) who first referred to early experiments and then described the process of scanning with the aid of analogies.

After dealing with various aspects of the Baird and Marconi-E.M.I. systems the lecturer described the equipment at the London television station with the aid of lantern slides. Each of the two studios employed four "Emitron" cameras and had its own control room, the signals from which were passed to the central control room before being fed to the radio transmitter, with facilities for mixing the various camera channels so as to achieve a satisfying artistic production.

For televising outside scenes there were several means of linking the mobile motor control van to the vision transmitter at Alexandra Palace. One was to employ a special balanced underground television cable, which connected Alexandra Palace with Broadcasting House and thence with various localities in Central London. Another was to use a radio link with a low-power mobile transmitter for which a wavelength of 4.7 metres was used. The third method was to extend the range of the television cable by transmitting the vision frequency signals over lengths up to two or three miles of ordinary telephone circuits, similar to those used for outside broadcasts in sound transmission. The general principles of receiver operation were next described, and, finally, a brief discussion took place on the problems involved in extending the television service to the provinces.

Cable Research in America

SOME of the more recent testing methods that are being applied to the quality rating of power cables in America were detailed, and testing appliances illustrated, in a paper by Mr. Kenneth S. Wyatt which was read before the London Local Technical Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION on November 29th.

From impressions gained during a visit to the United States the author explained that the intensive and widespread study of cable insulation which was going on in America was a partial consequence of the general American practice of rigidly testing materials and finished products. In addition, there was the fact that investment in cables commenced at an early date, and to-day involved a great deal of money.

For example, the investment in underground high-voltage cable together with the accompanying duct systems and accessories of one large utility concern represented 15 per cent. of its total capital investment of over 60 million pounds. The total length of high-voltage underground cable in operation in America now exceeded 16,000 miles. The annual investment in new paper insulated cable in normal times was about £5,000,000.

The author referred to the organisations through which research was carried out, the manner in which it was sponsored, the scope of the work and its accomplishments. He believed that the present objectives were the improvement of insulation quality uniformly along the cable length, so that wall thickness could be reduced, thus lowering the cost of underground lines as compared with overhead. It was also desired to keep the dielectric loss low throughout the useful life of a cable, not only when new; to increase the operating temperature continously, say, to 90 deg. C., so as to increase system capacity and, finally, to devise an inexpensive accelerated ageing test sufficiently reliable for specification purposes.

The Discussion

In the discussion Mr. D. A. S. Porteous, chairman, commented upon the enormous scope of cable research being carried out in America.

Mr. F. H. Sharpe pointed out that if a cable were made absolutely dense and homogeneous throughout it could not be bent, and he wondered whether the old-fashioned bending test should be reviewed. When disclosures made by tests resulted in improved manufacturing methods would users, if they had to pay more for cables, be compensated by getting a little more out of them by way of capacity? One would appreciate tests better a few years hence when experience in service had supported the results of the tests.

Mr. F. B. R. Roberts asked if the use of tapes of different thicknesses was usual, because it seemed to him that homogeneity of dielectric was almost essential. The only cable to which the author had referred as being "good" had three cores of more or less oval cross-section, but were oval cores better in every instance than circular cores? Some cables could hardly be relied upon unless they were pre-spiralled.

The author endorsed Mr. Sharpe's remarks concerning the improper interpretation of the observation of wafers, and emphasised the danger of trying to make wafers in order to prove some special point. He believed the production of better cables would result from the application of modern tests, by lining up the butt spaces, reducing the thickness of insulation wall, &c., so that the volume of oil would be reduced, the heat would get away much more quickly and the temperature drop across the cable would be reduced. When he warned one manufacturer in America that his cables lacked certain qualities and had submitted a number of wafers from those cables, that manufacturer had ordered 200 new taping machines in the course of a few months. In America, makers of telephone cables used the highest precision methods; why should it not pay the makers of power cables to do likewise?

When copper strands were crushed, powdered copper was formed on the surface, some of it so fine that it could be referred to as colloidal. It had so tremendous a surface area per unit weight that its reactivity was very high, and he believed it would react in oil instantaneously, forming copper "soap" which imparted very high dielectric losses to the insulation.

For the routine DC test at Detroit from 100 to 120 kV was applied to 24 kV cable, and high-voltage underground cable was tested there about once a year. In one case a length of cable had been left on the factory floor for a week or two before leading and had become moist, with the result that it failed in service a number of times. Then, on the advice of the manufacturers, who had promised to foot the bill, 140 kV was applied, resulting in about twenty-eight failures. Repairs were carried out and since then there had not been a failure on that cable. He regarded such testing as excellent, but it was necessary to use quite high voltages; it would anticipate faults.

Oval cores could be operated at roughly 10 deg. higher temperature than round cores. In America they were compacting the strands a good deal, which was said at first to render it more difficult to solder the sleeve on, but that was not true. A compact stranded conductor was more difficult to bend and one must take cognisance of that, but it was particularly valuable where there was a limited duct system because it enabled a great deal more load to be carried. He believed that prespiralling was the proper way in which to make a cable.

Mr. H. R. Scott suggested that it might be dangerous to

reduce insulation thickness and to rely on lapping control, because a machine might go wrong for a few seconds during the lapping process, and although wafers might show that a cable was good in many parts, it might be extraordinarily bad in other parts.

Mr. J. Parr Morley appreciated the value of the wafer method of examination from the point of view of effecting improvements in cables in the future, but he was concerned with its value in the examination of existing installations. It seemed that it would be a useful acceptance test, but was hardly applicable to the testing of installed cables, unless one was prepared to remove short lengths and replace them.

Mr. W. J. Oswald suggested that the wafer system lent itself to the examination of cables from time to time to show what happened to cables after they had been in use for various periods. Would the author advocate, when a fault had occurred, taking a sample from a point situated a short distance from the fault and then examining it by the wafer method?

The author, replying, said that the wafer test was perfectly forthright, and there was no wizardry about it; but he emphasised that wafer preparation was a precision job. The wafer test was of great value to manufacturers, because if the workmen in the factory could see the results of their work there was the likelihood of effecting a wealth of improvement. He did not think it was necessary to use that test so much in England; and he was sorry it was a destructive test, because he would like to cut pieces out of installed cables. The longitudinal wafers were much more interesting than the transverse, once the examiner had learned how to interpret them.

Smoke Abatement Conference

THE tenth annual conference of the NATIONAL SMOKE ABATEMENT SOCIETY, which was postponed on account of the international situation, was held at Cardiff on December 2nd and 3rd, under the presidency of Mr. H. A. des Voeux, M.D., whose address criticised the way in which industrial centres have been allowed to develop.

Among the papers submitted was one by Mr. S. N. Duguid, who pleaded for increased facilities for the better training of stokers. At the College of Technology, Manchester, two well-attended courses in boiler-house practice on the lines suggested by the author have been available for some years.

In a paper entitled "Electricity in South Wales," Mr. J. Smith pointed out that the extensive trading estate at Treforest was served with electricity and steam from the South Wales Electric Power Co.'s generating station at Treforest and that none of the tenant factories on that estate had chimney stacks.

It was a natural reflection of the character of the area that of the output of the South Wales Electric Power Co. by far the larger proportion was destined for industrial use, very large quantities indeed being required by the collieries, steelworks and tinplate works connected to the Power Co.'s transmission system.

Private industrial generating stations in the area were steadily becoming fewer in number and there was a general tendency to derive electricity from the authorised suppliers which in itself in an area where cheap fuel existed and waste heat was available was evidence that reliable and satisfactory services of electricity were generally available throughout the area at economic charges.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, December 15th. Institution, London, W.C.2. 6 p.m. "Empire Telegraph Communications," by Mr. K. L. Wood.

Meter and Instrument Section.—Friday, December 9th. Institution, London, W.C.2. 7 p.m. Joint meeting with the Physical Society. Discussion on "Electro-acoustics," to be opened by Dr. C. V. Drysdale.

Transmission Section.—Wednesday, December 14th. Institution, London, W.C.2. 6 p.m. Lecture on "The Organisation, Work, and Laboratories of the Dutch Testing Station for Electrical Material," by Prof. J. C. van Staveren.

North-Eastern Centre.—Monday, December 12th. The Newe House, Pilgrim Street, Newcastle-on-Tyne. 6.15 p.m. "Electricity in Coal Mines," by Mr. R. Nelson.

Western Centre.—Monday, December 12th. The Guildhall, Gloucester. 6 p.m. "The Application of Electric Heating to Domestic Hot-water Systems," by Mr. J. I. Bernard (Electrical Development Association).

Mersey and North Wales (Liverpool) Centre.—Monday, December 12th. Joint meeting with the Liverpool Engineering Society. "Electric Heating for Merchant Ships," by Mr. H. C. MacEwan.

North-Western Centre.—Tuesday, December 13th. Engineers' Club, 17, Albert Square, Manchester. 7.15 p.m. "Electricity in Coal Mines," by Mr. R. Nelson.

Scottish Centre.—Tuesday, December 13th. North British Station Hotel, Edinburgh. 7 p.m. "The Lighting Load—Its Characteristics and Development," by Mr. W. J. Jones (Lighting Service Bureau).

Devon and Cornwall Sub-Centre.—Wednesday, December 14th. The Athenaeum, George Street, Plymouth. 7 p.m. Informal meeting.

Northern Ireland Sub-Centre.—Wednesday, December 14th. Municipal College of Technology, Belfast. 7.30 p.m. Joint meeting of the sub-centre with the Belfast Association of Engineers.

West Wales (Swansea) Sub-Centre.—Thursday, December 15th. Technical College, Mount Pleasant, Swansea. 6.30 p.m. "Recent Progress in Power Rectifiers and their Applications," by Mr. W. G. Thompson.

Association of Mining Electrical Engineers (*Yorkshire North-West Branch*).—Saturday, December 10th. Barnsley. "Motor Faults and their Repairs," by Messrs. J. Laws and F. C. Smith.

West of Scotland Branch.—Wednesday, December 14th. Discussion on the 1937 Report of H.M. Chief Electrical Inspector of Mines.

Institute of Transport.—Monday, December 12th. Institution of Electrical Engineers, London, W.C.2. 5.30 p.m. Annual general meeting. Paper on "The Acceleration of Railway Services." Mr. S. H. Fisher.

Electrical Power Engineers' Association (*London Local Group*).—Tuesday, December 13th. Caxton Hall, Westminster, S.W.1. 7.15 p.m. "The Steam Cycle and its Limitations in Practice," by Major W. Gregson.

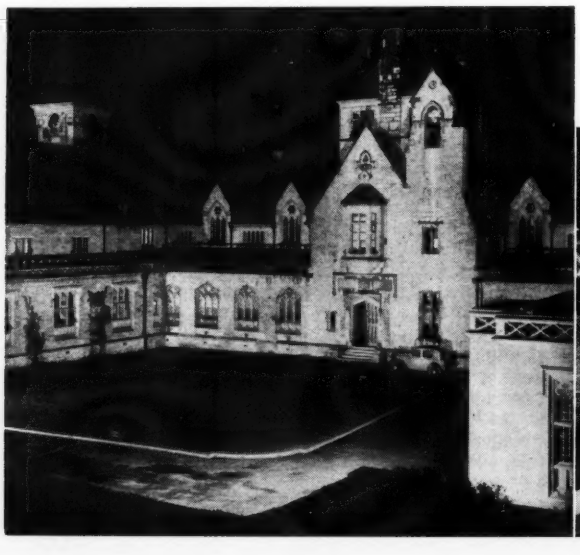
Institution of Post Office Electrical Engineers.—Tuesday, December 13th. Institution of Electrical Engineers, London, W.C.2. 5.30 p.m. "Some Applications of Automatic Telephone Apparatus Outside the Field of Telecommunications," by Mr. H. M. Wells.

Illuminating Engineering Society.—Tuesday, December 13th. Storey's Gate, St. James's Park, S.W.1. 7 p.m. "The Response of the Eye to Light in Relation to the Measurement of Subjective Brightness and Contrast." Paper by Mr. W. D. Wright.

Batti-Wallahs' Society.—Wednesday, December 14th. Hotel Victoria, W.C.2. 12.30 for 12.55 p.m. Luncheon. "The Cable and Wireless Systems of the World." Address by Mr. H. J. Wellingham.

Diesel Engine Users' Association.—Wednesday, December 14th. Caxton Hall, Westminster, S.W.1. 4.45 p.m. "The Starting of Diesel Engines."

North-East Coast Institution of Engineers and Shipbuilders.—Friday, December 16th. Mining Institute, Neville Hall, Newcastle-on-Tyne. "Electrical Propulsion of Ships," by Mr. L. R. Horne.



Two effective lighting installations recently completed:—Left: Howell's School, Denbigh, floodlighted by 1,000-W lamps in Holophane prismatic wide-angle projectors. Right: Charlton Greyhound Stadium, with Philips "Philora" blended lighting. The fittings house one 400-W mercury and two 500-W filament lamps. The totalisator is lit by 150-W sodium lamps

Here and There

By Nomad

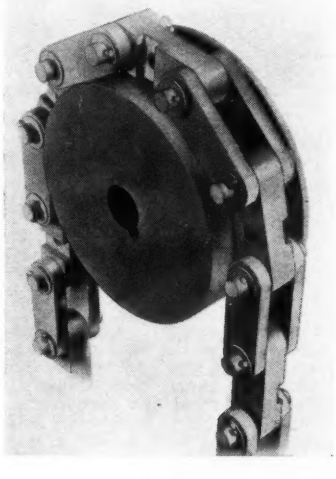
AS a result of my remarks in the ELECTRICAL REVIEW of November 25th on heavy-duty electrically heated presses for synthetic resin mouldings, the British Thermostat Co., Ltd., has sent me details of a thermostatic switch which it has developed for the temperature control of press platens. The temperature-sensitive element is a phial charged with a volatile liquid; this is connected by a capillary tube to a flexible metallic bellows which operates the switch mechanism. Change of temperature at the phial causes the bellows to expand or contract and this movement operates the switch against spring pressure.

* * *

For results of scientific investigations into the applications of electrical heating to moulding presses I would thoroughly recommend contact with Geo. Bray & Co., Ltd. In his paper to the Institution of Production Engineers Mr. F. T. Nurrish, works manager of that company, says that an important advantage that electric heat offers over every other form is rapid initial raising of temperature. Although a loading of 10 W per. sq. in. of platen surface is sufficient for a continuous working temperature of 350 deg. F., there is no reason why the platens should not be loaded as high as 25 W per sq. in. I have been assured that 25 per cent. increase of production can be obtained in this way with certain kinds of moulding materials.

* * *

I am constantly hearing of new uses to which synthetic resin materials are put and Ellison Insulations, Ltd., have kindly sent me particulars of some of the latest applications of "Tufnol." Although it is not directly electrical, I think the most interesting one is a "Tufnol" chain and jockey wheel in a steel works degreasing plant. The chain has to take straight pulls while working in a boiling solution of dilute hydrochloric acid and satisfactory service has been obtained at loads up to 600 lb.



"Tufnol" chain and jockey wheel designed for working in boiling dilute hydrochloric acid

Of the "Rockhard" synthetic-resin enamels and lacquers produced by Gittings & Hills, Ltd., I believe the most important to the electrical industry are the heat-resisting types suitable for heating appliances. These, I have been informed by the producers, require only 30 minutes' stoving at 220 deg. F.

* * *

I have often been asked what are the percentage electrical consumptions for the various services in collieries. The answer, of course, depends on the extent of electrification, the efficiency of working and various local conditions, but I can give the following figures which relate to a very large and efficient group of collieries in this country and to a recent year when the total production was about 1¾ million tons of coal. The percentage consumptions and the consumptions per ton of coal won in kWh were: Fans, 14.5 and 1.6; winders, 18.4 and 2.0; pumps, 26.8 and 2.9; screens, 8.1 and 0.9; air compressors, 0.6 and 0.1; haulage, 10.9 and 1.2; coal-cutting and conveying, 5.4 and 0.6; washers, 8.6 and 0.9; lighting, 1.5 and 0.2.

What interests me more, though, is the relative electricity and boiler coal consumptions. From 1930 to 1935 the total coal raised increased from 1.25 to 1.67 million tons, while the proportion which was machine mined rose from 37 per cent. to 75 per cent. The amount consumed in the boilers fell from 3.8 per cent to nil and the electricity consumption per ton fell from 9.8 kWh in 1930 to 8.3 kWh in 1932 and rose to 10.8 kWh in 1935, the low figure corresponding with 60 per cent. machine mining, 0.8 per cent. consumption in the boilers and 1.45 million tons total production.

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Electricity on the Farm

With reference to correspondence under this heading in the REVIEW of December 2nd I notice that Mr. H. D. Phelps gives it as his opinion that ploughing by electricity will not pay. He objects to the expense of the farm power line and trailing cable, but does Mr. Phelps know anything at all about land or the expense of equipping a farm?

To equip a good arable farm with buildings alone will cost as much as the value of the land, to drain the land will cost about the same amount, to erect fences will cost from 10 to 20 per cent. and to erect a low-voltage power line would cost about 2 per cent.

It is customary for a farmer to ask the proprietor at the beginning of a lease for some improvement—a hay shed or some new fences or whatever may be urgently required. If the electric tractor were properly developed the power line would fall in as the ordinary equipment of the land and would belong to, or be taken over by, the proprietor at the end of the lease. The trailing cable has such a long life (there is practically no wear) that its price is not unreasonable, but the great saving to the farmer is that he would have a fool-proof, life-long machine that would pull as well when twenty years old as on the first day of its use.

It is easy to talk of light tractors on pneumatics, and they are useful machines in their place, but if we drive them hard and constantly their life is short, efficiency drops from the first day, and in a couple of years the repair bills and increased oil and fuel accounts make them little better than scrap. For this reason farmers are keeping these light machines off the heavy work and reserving them for light drill cultivation and transport. The heavy work is tending to fall to a heavy cultivating and ploughing set which may easily cost £500 or £600. How long these sets will stand up we do not yet know, but it is certain that the electric set would do the work of this heavy tractor and be very much cheaper to run and to maintain.

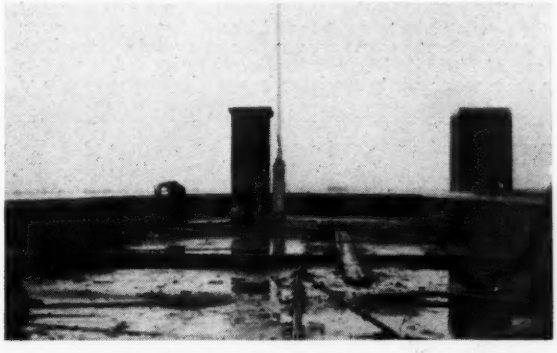
The farmer will at once get cheap power when he can cultivate his land with it, but at present I am paying 2½d. per kWh for power in the steading, which is far from being cheap. I am informed that with tillage the price would drop to ¾d. per kWh, and no oil tractor could touch this. Home-produced power, a new industry and a really efficient tractor for the farmer, are, in my opinion, points well worth consideration in these unsettled times. ANDREW MCDOWALL.

Mungoswells, Drem, E. Lothian, *December 5th.*

Earth Continuity

I have heard that the I.E.E. proposes to reduce the one-ohm standard for earthing resistance to 0.5 ohm. This ought to be perfectly sound as with a good screwed-conduit installation much lower readings are obtainable. On the other hand, as an electrical installation foreman, I have found that the appallingly wet conditions that exist on most of the present-day modern buildings counteract good workmanship and compliance with I.E.E. Regulations.

As an instance, I had in hand a few years ago an installation for a town hall in London. The conditions on this structure were comparable to the water-front of a fishing harbour. Wood flooring was laid before even a temporary roof was provided. The roof was eventually added and insulated with a "pumice" filling, which is porous. Meanwhile it rained and continued to rain for several days, thereby holding up the



Installation work under difficult conditions

New Books

Radio Frequency Electrical Measurements. By H. A. BROWN. (Pp. 384; illus.) London: McGraw-Hill Publishing Co., Ltd. Price: 24s.

THIS is a second edition of a similar work published in 1931. Its scope takes in circuit constants, frequency measurements, aerials, electrical measurements, wave propagation, vacuum tubes, and general measurements on apparatus. The level of the book is generally high, the chapter on "frequency measurements" being particularly good, and, throughout, the work is free from error.

A comparison of the present edition with that of 1931 shows that little alteration has been made, either in the length of the book or in the general layout, except for the excision of obsolete material and the addition of new to replace it. This is a tribute to the 1931 edition, which appears to have been in advance of the times, rather than as derogatory to the present book, as we are of the opinion that the revised edition is a useful work and can be recommended to all students requiring a general guide to HF laboratory measurements.

More prominence might have been given to the discussion on modern high-frequency measurement equipment, as there is so much valuable new apparatus of this kind available to the wireless engineer these days. It is true that much of the more useful measuring equipment is mentioned in the text with older and less useful gear, but it might have formed a bigger feature of the book. Further, although the chapter dealing with aerials is interesting as describing various forms of aerials met with, it is somewhat out of date as regards aerial measurements and calculations, considerable advance having been made on this subject.

Like certain other American writers, Prof. Brown appears to be unacquainted with the work of European radio engineers, unless they happen to be contributors to the I.R.E. *Journal*. For instance, not a single reference appears throughout the book to any publications in the *Journal* of the I.E.E.—A. W. L.

Lehrbuch Der Physik. By GRIMSEHL and TOMASCHEK. (Pp. 866; figs. 1209.) Leipzig: B. G. Teubner.

This part of Grimsehl's textbook of physics deals with the electro-magnetic field and optics. It has reached its eighth edition. The major sections in it are the electric and magnetic field, continuous currents, the electric field which varies with time, and optics.

Although the book is considered by its author to be suitable for use as a supplement to lectures and also for private study, its main value should be in the former sphere, as a normal private student could only hope to benefit from it after mastering numerous simpler works. It should also be a valuable book of reference. The majority of the work deals with matters of theory and laboratory practice. There is, however, an interesting chapter on alternating currents which concludes with observations on power transmission practice. The author is clearly less familiar with the latter subject and his observations may mislead students. He also describes the Thomson and Aron clock meters, both of which are now almost museum pieces.

In the event of a scheme of rationalisation of textbooks of science being undertaken in Germany, the section on electrophysics could confidently be based on the present volume.—C. W. M.

Works Organisation and Management. By T. H. BURNHAM. (Pp. 330). London: Sir Isaac Pitman & Sons, Ltd. Price 8s. 6d.

Management to-day demands more than the application of common sense. Under modern industrial conditions it has developed into a calling necessitating a systematic scheme of education. A study of management principles and technique, of duties, responsibilities and attitude of mind is essential if the young graduate is not to find himself lost in appreciating his position in the works organisation as a whole. This book is one of Pitman's Engineering Degree series and is written for those who wish to specialise in the administrative side of engineering practice, and in particular to cover the fundamentals of works organisation and management for the I.Mech.E. examination.

The scope of the work is wide. In addition to the subject matter indicated by the title there are chapters on design administration and quality control, and on sales organisation and tendering. This is somewhat unusual in a book on works organisation, but by no means out of place. The main part of the book is devoted to production and progress control with supplementary chapters on purchasing, costing, personnel policy and wages payment, site and layout of works, and buildings and fixed equipment.

Throughout, the book is written from the engineer's standpoint. More than this, it shows the developments that have taken place in management itself through the adoption of engineering technique. This treatment is most marked in the chapter on the economics of production. Here the author shows the significance of the interplay of overhead expense and volume of production, and develops mathematically the factors affecting the optimum size of production orders, the economic selection of materials and the economic use of equipment, jigs and fixtures. Similarly, the chapter on personnel policy is copiously illustrated with formulae and curves, although here the author would have been better advised to give a little more space to actual practical experiences with the adoption of the various methods of payment. It is only fair to point out, however, that for those who wish to follow out more fully any aspect of the problem, each chapter is rounded off with a bibliography of more specialised works.—A. W. W.

AC Motors of Fractional Horse Power. By H. H. JONES. (Pp. 190; figs. 183.) London: E. & F. N. Spon, Ltd. Price 7s. 6d.

This book is referred to in its sub-title as a manual of design, construction and maintenance, and purports to describe the working principles of AC motors and to give sufficient data for their construction. It appears to be written from an amateur viewpoint and as such is not of great value to engineers concerned with the design, manufacture and application of commercial motors. For example, one reads on page 39 that the "field ring (*i.e.*, field magnet) proportions will be decided by the maker of the stampings and their design need not be considered," on page 60 that brass rods and rings may be used instead of copper in squirrel-cage rotors, and on page 141 that commutators made by specialists can readily be obtained and single components can often be procured from garages.

There are no sectional views, and little description of commercial machines, nor any tables or curves of performance characteristics such as might reasonably be expected in a work of this title.

The book opens with a chapter on elementary circuits and magnets, followed by an outline of AC motor types and chapters on the universal motor, repulsion and induction motors, synchronous motors and eddy-current machines. The remainder is devoted to a consideration of armature and stator winding, materials, mechanical details, testing, faults and remedies, and a final chapter on silencing methods including the suppression of radio interference.

The treatment of each chapter is superficial, but the impression is gained that the author has considerably more knowledge of his subject than appears in the volume, and it is suggested that the style could be usefully revised so that more information could be included. The volume is well produced but some of the diagrams should have been redrawn to conform with modern textbook standards.—S. F. P.

Questions and Answers in Telegraphy and Telephony. By W. S. PROCTER. (Pp. 205; figs. 125.) London: Sir Isaac Pitman & Sons. Price 6s.

The author of this useful pocket-size book is well known for his publications on the subject of telecommunications, and this, coupled with the fact that the questions and answers included were originally published as supplements to the *Post Office Electrical Engineers' Journal*, is a sufficient recommendation of the standard of the work under review.

The contents consist of questions selected from examination papers in all grades of telephony and telegraphy set by the City & Guilds of London Institute during the years 1932-1934, together with model answers of a length which might be expected from a highly qualified candidate taking the relative examination. The answers are concise and clearly written, and are liberally illustrated with sketches and diagrams as necessary; factors which the student should note in particular when preparing himself for the actual test of examination. Approximately 100 questions and answers in telephony, and fifty in telegraphy, are included.

The recent recasting of the City & Guilds syllabuses in the various telecommunications subjects, particularly in telegraphy, has had the effect of reducing somewhat the utility of this excellent work. There is no student, however, who would not find much of interest and information, and a great deal of useful guidance by a careful study of this book.—H. E. W.

Correspondence *(Continued from preceding page)*

asphalting, with the result that the asphalt was laid on a pool of water for the egress of which there were only the holes occupied by our lighting points. Our job was rust-bound and our earthing continuity spoilt. Three years later the supply undertaking asked for our views as to reasons for the bad continuity.

We are now engaged on a contract which specifies materials and workmanship of the highest quality, including the use of galvanised conduit and fittings and male brass bushes. We are endeavouring to produce a 100 per cent. job but our work lies in water. During this past week of rain and storm the roofs have been constructed—pumice again—and green corrosion is attacking the bushes and sockets. The builders tell us that nothing can be done to help matters, but the earth continuity will be ruined.

A. T. CONSTABLE.

Kenton, *November 29th.*

New Electrical Products

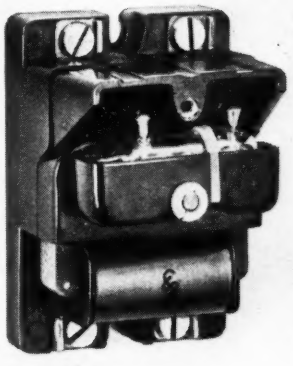
A review of equipment recently marketed

Daylight Reflectors

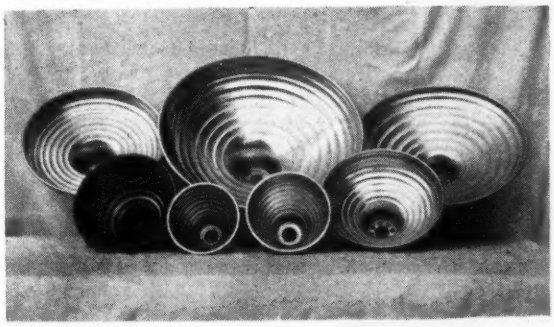
ABOUT a year ago we referred to the production by Daylight Alloy Reflectors of spun aluminium reflectors with horizontal flutings designed to produce a "daylight" effect without the use of filters or blue bulbs. An ordinary pearl lamp is employed, a substantial degree of colour correction being obtained by specially treating the reflecting surface.

Certain improvements have now been made in these reflectors, for which BAXTER & CAUNTER, LTD., 33-37, Alfred Place, London, W.C.1, have recently been appointed sole distributing agents for London, the south and south-eastern counties. The reflecting surface is tinted a lighter shade of blue, so that without undue absorption an appreciable proportion of blue light is provided. This makes seeing easier by reducing eye strain and preserving to some extent the natural appearance of coloured objects. The tinting is permament, has good insulating properties, is non-inflammable, rust-proof and very durable. The exterior surface is buff enamelled, but other colours are obtainable according to individual requirements.

The wider range now available for lamps of from 25 to 200 W includes intensive types of from 5.5 to 8 in. in diameter and extensive patterns of from 10 to 20 in. The angle of cut-off is now made to comply, where applicable, with B.S.S. 232. The smaller sizes are attached by means of the lampholder ring in the usual way, while for the larger reflectors appropriate weatherproof galleries are available, forming a lightweight assembly.



Below: A group of "Crectalite" reflectors; the dark one on the left is the older type



A Suspended Fan Heater

The "Cyclone" suspended unit fan heater, a recent product of MATTHEWS & YATES, LTD., Swinton, Manchester, consists of a steam or hot water heating unit, a fan, a motor driving the fan and a housing with louvres so designed that there is no restriction on the flow. The louvres are attached to an adjustable cowl which can be set at any angle, so that the air can be delivered in full volume to floor level from a height of 35 ft.

The high and low speed fans are designed to give air velocities of 950 and 650 cu. ft. per minute and care has been taken to proportion the heating coils to the fan output to avoid overheating of the air. The fan loading is 60 W.

Self-reversing Mercury Switch

For remote multi-point control of a lighting circuit carrying up to 3¼ A, SIEMENS-SCHUCKERT (GREAT BRITAIN), LTD., Great West Road, Brentford, have introduced a mercury-switch unit which is self-reversing and can be operated from a 6 or 8-V bell transformer. The unit consists of a squirrel-cage armature mounted on a spindle that is free to move within a field system and is connected rigidly to the mercury switch. Riding loosely on the spindle is an iron rocker bar which is normally held in a horizontal position by a spring.

When the field coils are energised differences in the reluctance of the magnetic path cause the rocker bar to rotate the cage, thereby closing the mercury switch. As soon as the current in the coil is interrupted, the bar returns to the horizontal position but the cage remains. As soon as the coil is energised again, however, the new path followed by the magnetic flux results in the cage rotating in the opposite sense thus opening the mercury switch. It is claimed that in addition to silent operation, the use of the switch lessens interference with wireless reception and more so if a rectifier be substituted for the transformer.

The Siemens self-reversing mercury switch

Motor-driven Syrens

A new range of motor driven syrens has been introduced by ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, London, S.W.1.

The syrens embody totally enclosed motors, and are suitable for installation in the open air without any other protection. Models are available both for three-phase and single-phase AC and DC. In the DC and three-phase types, four sizes are available, the largest of which has a range up to five miles under favourable conditions. For single-phase installations, one size only is made, with a range under the most favourable conditions, of 1½ miles.

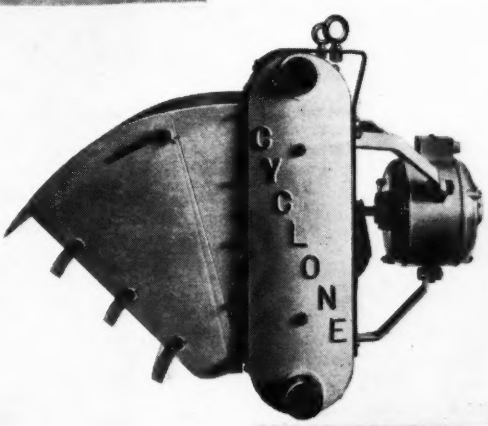
Apart from their obvious use in connection with air-raid precautions, the smaller sizes of these syrens find many other applications, such as fire brigade calls, ship signals and general works use. For special installations, a device can be supplied by which the syren can give two different tones.

Improved Lighting Fittings

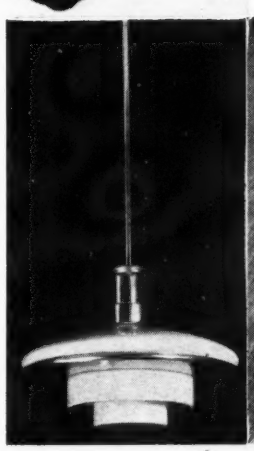
Improvements affecting maintenance, light output and distribution, wiring facilities and suspension have been made to the "Faraday-Megaphos" lighting fittings produced by OSLER & FARADAY, LTD., 89-91, Newman St., W.1. In the new "Series II" models a considerable modification of the original design has resulted in the elimination of all loose parts, including the screws formerly required for fixing the glassware top and bottom.

In order to give alternatively either concentrating or diffusing distribution the fittings incorporate interchangeable aluminium reflectors which are anodised by a special process. The glassware is in two sections. The top is flashed opal, which the stepped bottom portion has its vertical components opalised and the underside either clear or frosted. a special upward clear glass step being incorporated to obscure the filament from view.

An anodised aluminium finish is now available as well as bronze for the suspension metal work, which consists of ⅜ in. diam. suspension tubes, while another new feature, which has also been adopted for the company's "Simplite" units, is a two-screw fixing enabling the



The "Cyclone" unit fan heater



Right: The "Faraday-Megaphos" fitting showing the construction

whole of this metalwork to be easily dismantled for wiring or inspection.

Five different types of the fitting are produced including one semi-indirect model. An attractive catalogue containing technical information has been issued in connection with these units.

Domestic Appliances

New domestic electrical appliances recently introduced by the HOTPOINT ELECTRIC APPLIANCE CO., LTD., 24, Newman Street, London, W.1, include a cabinet type washing machine, an automatic iron and a table ironer.

The washing machine has several special features. For instance, the wringer attachment is housed in a cupboard under the tub; for draining the washer a bucket is placed in this cupboard and is then under the tap.

The wringer is of pressure-die-cast aluminium construction with a specially shaped switch, while a finger touch pressure release is also incorporated. The gyrator and motor are controlled by neat sunk switches on the front of the cabinet, which is finished in mottled green or cream with or without a vitreous enamelled table top.

All mechanism, including the B.T.H. motor, is resiliently mounted; dual resilient couplings and bevel drive are employed. The tub, which holds 11½ gallons, is a one-piece aluminium pressing and the measurements are 22 in. square by 34 in. high. Castors are fitted.

The heat-controlled iron has a swivelling cord connection at the back of the iron so that in whatever direction the iron is being pulled the cord will not twist. The five heats, thermostatically controlled, are for art silk, silk, wool, cotton and linen, and a double thumb rest is provided for both right- and left-handed users. Similarly, a button groove is situated on both sides of the iron and the handle is of a special shape designed for a comfortable grip. The weight is 6 lb. and the loading 800 W.

The thermostatically controlled table ironer has three heats, but there are two switches so that either or both ends can be used at the same time. The ironing surface area is 266 sq. in. The material to be ironed is spread over the "buck," and by pulling forward a short lever the ironing shoe is automatically brought down on top of it. The movement of a second lever then applies a pressure of 300 lb. The base, which is finished in a mottled enamel, measures only 8 in. by 19 in.

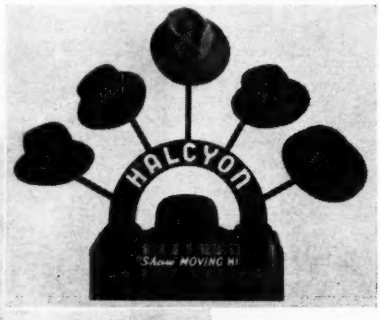
Moving Neon Signs

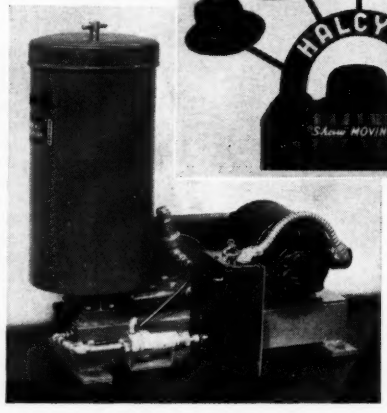
A full range of moving neon signs in sizes suitable for all users from the small shopkeeper to the cinema proprietor has been developed by NEON LUMINATIONS, LTD., 60, Newman Street, London, W.1. Under the "Shaw" system adopted, the neon lamps themselves are stationary and the letters formed of "Rexine" and net or organdie pass in front of them on continuous motor-driven bands or chains.

The Hotpoint cabinet washer, hand iron and table ironer

In the "Baby" unit the smallest, which is suitable for shop-window displays, &c., only one lamp is employed to illuminate the message, which may have up to forty 1-in. letters. This model, like many of the larger units available, has a fixed message on a band (which is, however, easily changeable), but other types of sign can be had with interchangeable letters or even illustrations, &c. This latter feature is, of course, particularly valuable for announcing the programmes of cinemas, &c.

Unlike ordinary fixed neon signs, the whole of the letter is uniformly illuminated. This is claimed to have the effect of making a 12-in. letter equal in apparent size to a 15-in. or even an 18-in. letter in ordinary neon. Service and maintenance are much simplified by the use of standard shapes and sizes of lamps, while a further recommendation is that (in a multi-lamp unit) the failure of a lamp does not affect the legibility of the sign.





Above: One of the new moving neon signs and (left) the Tecalamit electric lubricator

Electrically Controlled Lubrication

An electrically controlled one-line lubrication system known as the "Flex-o-Matic" is a recent introduction by TECALAMIT, LTD., Great West Road, Brentford, Mdx.

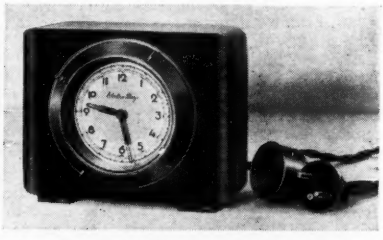
In brief, the "Flex-o-Matic" single-line injector system consists of a lubricant compressor and a single supply line leading from the compressor to a number of injectors mounted either on the bearings to be lubricated or in proximity to the bearings and connected to them by suitable conduits. Each injector is correctly adjusted to discharge the proper size shot of lubricant to the bearing every time the compressor is put into operation.

Both semi-automatic and fully automatic motor-driven outfits are available. An automatic bleeder valve is incorporated and a convenient push-button switch is used for the operation. When all the injectors are completely discharged the bleeder valve opens automatically and in so doing actuates a second push-button switch which breaks the circuit and stops the pump. A 1/6 HP repulsion induction motor with a high starting torque is connected to the pump through V-belt reduction pulleys.

Time-switch Clock

A time-switch clock of unusual design has been introduced into this country by the SCHULER CLOCK CO., 47, Milton Street, London. It is, in appearance, like an ordinary alarm or dining-room clock (according to model), but the bezel is turned round to set the time switch.

Up to 72 operations of the switch in 12 hours can be set in advance with ten-minute intervals. The bezel is rotated until a marker points to a division on the outer scale of the dial which indicates the switching-on time. The long protruding pin is then pressed in and the time of switching on is marked by a pointer which comes into position on the dial. The pin is then withdrawn and the red pointer moved to the time of switching off, the whole process being repeated until the required number of positions has been indicated. Settings can be cancelled by pressing another pin, and the settings are self-cancelling after use. The time switch is rated at 600 W DC or 1,200 W AC on 250 V and is therefore suitable for radio sets, small electrical appliances, or lighting. Another type designed for wall fixing is rated at 1,200 W and 2,400 W at 250 V.



The Schuler time switch

Fish Scaling Machines

An entirely new development is an electric fish scaling machine. It has been produced by N. A. STRAND & CO., Chicago, U.S.A. There are various models. The drive is by a ¼-HP motor through flexible shafts with a safety scaler-cutter for scraping the scales from the fish without cutting or gouging into the flesh. It is stated that not only is the scaling very much more rapid than by hand, but it also makes a very clean job.

Unidirectional Road Lighting

Safer night driving

ON a double carriageway road where each carriageway carries traffic proceeding in one direction only, an ordinary lantern will throw light in the same direction as the traffic flow. This light is not only wasted, but may also do harm by tending to light up vertical surfaces; it thus reduces their contrast against the bright background of the road surface and hence the revealing power of the installation ("revealing power" was the subject of a recent paper read by Mr. J. M. Waldram to the Illuminating Engineering Society). A further point is that the appearance of a double-carriageway road lighted with normal "brightness" lanterns has a large number of visible light sources which produce a "milky-way" effect and their elimination when not actively producing road brightness should greatly increase comfort.

A demonstration of a system of unidirectional lighting control in the G.E.C. research laboratories was given on one carriageway of the Great Chertsey Road, Twickenham, where standards already exist in the double staggered formation, the mounting height of the lantern being 25 ft. and the average spacing about 189 ft.

Eight lanterns specially designed to give light in the direction opposing the traffic were mounted on poles on the west carriageway. Each lantern was equipped with a 250-W horizontal "Osira" lamp giving a light distribution similar to that of one-half of the normal iso-candle diagram for a 400-W lantern. On account of the relatively long spacing the best results were obtained with the peak candles at 83 deg. above vertical, but this angle could be reduced by employing a closer spacing.

Visibility and revealing power were found to be good. The hardness of contrast between objects on the road and the bright road surface was particularly noticeable; the silhouette effect being pronounced. The road surface was matt, but even so the result appeared to indicate that an installation of back cut-off lanterns enables the wattage of lamps on double carriageway roads to be at least halved.

Driving in the opposite direction on the other carriageway the road lighted with back cut-off lanterns disappeared completely (although its traffic could be distinguished by the vehicle lights) and the impression gained was that of driving down a single carriageway road with no traffic in the oncoming direction. The back cut-off lanterns on the other carriageway were invisible.

Looking towards the unidirectional lanterns. The right-hand carriageway has ordinary lighting

Normal lighting in left-hand carriageway and new G.E.C. unidirectional lighting on the right—there is no light emitted from this side of the lantern, the streaks of brightness in the distance arising from the reflection of normal lanterns on the wet road surface

As the road runs through almost open country all light emitted beyond the boundaries of the pavement was wasted as there were no backgrounds which could be lighted up. The conclusion reached was that on a road of this type there is nothing to be gained by using lanterns with a light distribution which is very wide in azimuth, as only the road and pavements need to be lighted.

The central reservation of the Great Chertsey Road is fairly wide and two lanterns are employed on long brackets on the central columns. If a similar system were to be used on a double carriageway road with a narrow central island, a single "brightness" lantern of normal design could be used on this with back cut-off lanterns equipped with lamps of half the wattage on the standards on the outer kerb.

This experiment was carried out by the General Electric Co., Ltd., with the permission of Mr. G. R. King, borough engineer and surveyor of Twickenham, and with the co-operation and assistance of the London and Home Counties Joint Electricity Authority.

Greek Electrical Imports

IN his report on economic and commercial conditions in Greece (Stationery Office, 1s. 6d. net), Mr. S. R. Jordon, recently Commercial Secretary to H.M. Legation, Athens, states that since the last report was written (April, 1937) the external trade of Greece has followed closely upon the lines of 1936. It is still subordinated to the exigencies of the numerous clearing conventions which have been concluded with countries, principally Germany, and the system has driven her trade into well-defined channels, to the detriment of those countries not allied to Greece by clearing conventions or having a favourable balance of trade in their commerical relations with her.

The United Kingdom falls within the latter category, and her trade with Greece has suffered in consequence. In an appendix to his report Mr. Jordon gives the value of imports into Greece during 1937, from which we have selected the following electrical items showing the increases or decreases as compared with the preceding year:—

	1937 Value in thousand drachmae.	Inc. or dec. on 1936
Electric lamps—		
Total	13,522	− 4,831
From Austria...	1,827	− 1,157
,, Germany	7,356	− 368
,, Hungary	2,301	− 2,558
Instruments and apparatus for applied electricity—		
Total	119,063	+ 30,896
From Austria...	2,077	+ 933
,, Germany	91,815	+ 23,364
,, United Kingdom ...	7,299	+ 2,685
,, U.S.A.	12,469	+ 1,546

	1937 Values in thousand drachmae.	Inc. or dec. on 1936
Dynamos and electric motors—		
Total	27,406	+ 3,808
From Austria	7,296	+ 1,083
,, Germany	17,153	+ 3,491
Radio receiving sets—		
Total	17,228	− 5,541
From Germany	2,348	+ 42
,, U.S.A.	11,375	− 2,443
,, United Kingdom ...	615	− 393
,, Holland	2,245	− 2,343

	1937 Values in thousand drachmae.	Inc. or dec. on 1936
Telegraph and telephone instruments—		
Total	11,838	+ 4,440
From Germany	6,221	+ 5,233
,, United Kingdom ...	3,188	− 54
Electrical porcelain —		
Total	35,656	+ 8,475
From Austria...	1,208	+ 465
,, Germany	26,213	+ 3,471
,, United Kingdom ...	7,120	+ 4,184

Parliamentary News

(BY OUR SPECIAL REPORTER)

Electricity Tariffs

IN the House of Commons on November 30th Mr. Magnay asked the Minister of Transport if he was aware that certain electricity suppliers were now penalising consumers by threatening the withdrawal of favourable tariffs and the substitution of more onerous ones if, in addition to lighting, they did not install electricity for cooking and heating purposes, and if, in view of the fact that this policy of duress was causing great expense and dissatisfaction, particularly among many consumers in the London area, he would take immediate steps to see that such consumers should have complete freedom of choice and should in no way be penalised.

Mr. Burgin said he had asked the Electricity Commissioners to make inquiries and would notify his hon. friend of the outcome.

The McGowan Report

Mr. Magnay asked the Minister of Transport if he was aware of the widespread disappointment at the omission from the Government's legislative programme of a measure to remedy the present chaotic state of electricity distribution in accordance with the recommendations of the McGowan Report and the Government's outline of proposals; and if he could give industrial and private consumers who were vitally affected some assurance that this question would receive attention in the near future.

Mr. De la Bere asked whether the Minister of Transport could give some information regarding the proposed legislation to ensure an adequate supply of electricity in the rural areas and to enable farmers throughout the country to have electric power available.

Mr. Burgin said that he was not in a position to add to the answer given by the Prime Minister on November 10th.

Overhead Lines

Mr. Tinker asked the Minister of Transport if he would give the number of pylons in use carrying electric cables, and the length of ground they covered; and would he give the proportion of overhead and underground electric wires and cables.

Mr. Burgin said he had no information as to the number of pylons carrying overhead lines in Great Britain, but the approximate length of overhead transmission and distribution lines (exclusive of service lines) at the end of the year 1937-38 was 44,000 miles out of a total of 147,000 miles of underground and overhead lines, or nearly 30 per cent.

The Live Rail

Brigadier-General Clifton Brown asked the Minister of Transport how many of the five trespassers who met their deaths from the live rail on the Southern Railway this year were children and how many were adults; and how many miles of the electric rail were still unprovided with the new protective fencing.

Mr. Burgin said that all five, he regretted to say, were children. He was informed by the Southern Railway Co. that 47 miles, in the aggregate, of this fencing had been erected and that the total route mileage of their electrified track was about 663 miles, the great bulk of which was immune from trespass by children.

Electricity on Farms

Sir Irving Albery asked the Minister of Transport whether he had any statistics showing to what extent electricity was being supplied to farms for agricultural purposes; and whether he was satisfied that electricity was available at economic rates and with servicing facilities similar to those offered in the United States of America.

Mr. Burgin said he had no statistics of the amount of electricity supplied to farms for purely agricultural purposes, but in 1936-37, which was the latest year for which he had the figures, 25,000 farms and horticultural premises out of a total of 136,000 in Great Britain were supplied with 42,000,000 kWh for general use. Owing to the different circumstances he was not in a position to make a useful comparison between rates and services in this country and in America.

Midland Television

On December 1st Mr. Poole asked the Postmaster-General when he anticipated being able to make available a television broadcast service in the Midlands.

Sir W. Womersley said that the question of extending the television service to areas outside the range of the London station had been considered by the Television Advisory Committee who had decided that further research was necessary on certain aspects of the problem. This research was still in progress, and until it was completed the Committee would not be in a position to make any recommendation.

Wireless in the Colonies

On December 5th Mr. O. Lewis asked the Postmaster-General if he had any statement to make on the subject of the offer by Cables and Wireless, Ltd., to provide a system of wireless telegraphic and telephonic communication throughout the Colonial Empire without cost to the administrations or to the peoples concerned.

Major Tryon said he understood from the Secretary of State for the Colonies that Cable & Wireless, Ltd., had submitted proposals for the installation at its own expense at cable stations in the Colonial Empire of radio sets, primarily to supplement the cable communications and for experimental purposes. The Secretary of State was in consultation with the Colonial Governments concerned with regard to these proposals.

Rural Electricity Supply

Mr. Hall Caine asked the Minister of Transport whether he was aware that approximately 90 per cent. of the agricultural holdings of this country were at present without electricity supply; how that proportion compared with that obtaining in Holland, Denmark, Sweden and Germany; and whether he could now give an assurance that the question of rural electricity supply in this country would be dealt with as one of urgency.

Mr. Burgin said that while no official statistics were available as to the number of agricultural holdings in Great Britain which had a supply of electricity, he was informed that at the end of the year 1936-37 approximately 25,000 farms and horticultural premises out of 136,000, or just over 18 per cent. were obtaining a supply. With regard to the second part of the question, he had no information which would enable him to make such a comparison. With regard to the third part he could not amplify the recent statement by the Prime Minister.

In the Courts

Colliery Officials Charged

AT Hamilton Sheriff Court last week A. G. Moore & Co., coalowners, Glasgow, William Kerr Christie, Uddingston, James McCann, Uddingston, and William Mitchell, senior, Newton, were charged as owners, manager, electrician, and assistant electrician respectively, at Blantyreferme Colliery, with failing to comply with the regulations, in that on March 11th they used a multicore cable not protected by a metallic covering between a gate-end switch and fusebox. They were also charged with having failed to see that the armoured covering of a cable was properly secured to the switchbox. The case was a sequel to the death of two mineworkers.

A workman in his evidence said a new road was being driven in a section of the colliery and it was his duty with another workman, now deceased, to shift the pan conveyor to the new road. They required to take two pans over a gate-end box. The height of the workings was only two feet nine inches, and witness and his companion had to crawl. Witness crawled over the gate-end box and leaned over and helped his companion to place the pan on top of the box. He then pushed a cleek into a hole at the end of the pan and pulled, while the other man pushed from the other side. They had not moved the pan far when witness felt an electric shock. He could not release his hold on the cleek for a few minutes, and then he was thrown to the ground. His companion was lying on the pan. Witness touched the pan and again received a shock. He went down the road for assistance and found a man (the other victim) lying dead with one hand on a metallic cable. Another witness said he heard someone shout to switch off the current and ran to the gate-end box. As he touched the handle he received a shock, but managed to switch off the current. A coal-cutting machine man said he obtained power from the gate-end box for the pan conveyor and the coal-cutting machine. While working the machine he received a shock. He went to the gate-end box and found a pan lying partially over it. He later found a man lying dead with a hand on the cable.

Mr. Richard Crawford, Electrical Inspector of Mines, said that he found the incoming cable completely detached from the switch-box. One of the studs was worn at the thread and was lying on the pavement. The effect of this was to release the grip of the armoured cable. There was evidence of short-circuiting, and it would appear that a live strand of the cable had come into contact with a part of the switch-box. The cable going from the switch had no armoured covering. As a result of the short-circuit, fuse boxes and cables throughout the section would become live. One of the deceased would receive a shock from the armoured cable passing between the fuse box and the fan switch. Witness formed the impression that the stud which had fallen out had been used as a bolt, and had been over-strained. Its condition should have been apparent to anyone working with the cables.

Dr. Robert Hunter, a metallurgist, who had made an examination of the gate-end box, said a possible reason for the stud being in an imperfect condition was that it had been used for a period of time as a tap bolt. That, of course, meant that every time the gland was removed the stud was also removed. Another possibility was that at one time the thread in the gate-end box was stripped and an imperfect thread allowed to remain when a new stud was fitted. If the bolt had been withdrawn by the use of considerable force he would have seen evidence of that in his examination. There was, in fact, no fracture of the casting in the gate-end box and no distortion of the thread on the stud was visible.

Mr. George Millar Harvie, Deputy Electrical Inspector of Mines, was of opinion that the wearing of the thread in the tap hole of the switch-box was not recent. In his view,

the switch-box and fan switch were not "portable apparatus" as laid down in the regulations. The position was that the gate-end box was not adapted for armoured cable at the output end, and the gate-end switch-box should not have been used for the middle of a circuit, but should have been at the end of the coal-face. Replying to counsel for respondents, Mr. Harvie would not agree that, in a case where transition was proceeding underground, and temporary arrangements were being made, all apparatus might be regarded as portable. He did not see that the fact that temporary arrangements were being made had anything to do with it. Portable apparatus was apparatus where flexible cable was required. There was little apparatus requiring flexible cable, and he mentioned coal-cutters, drills and conveyors.

William Mitchell, jun., assistant electrician at the pit, was the first witness for the defence. He said that on February 12th he made an extension to the cable. He then examined the switch and fuse-box. He uncoupled the cable from the box and extended the cable and then moved the switch and fuse-box to the end of the new cable. He did not take the studs out of the switch-box. He opened up the armouring of the cable to make an end, and after fixing the cable inside he put the nuts on to the studs, which he found quite secure. Immediately after the accident he examined the box and saw that the stud had been torn out.

C. B. Watson, manager of the Uddingston branch of the firm which manufactured the switch-boxes, said the fracture of the thread in the tap-hole had been made recently, and in his opinion it was caused by a severe blow on the stud.

James McCann, who has had 25 years' experience as chief electrician in a coal mine, spoke of an unusual procedure being followed of finishing up an old coal face and opening a new one simultaneously. He consulted with his chief assistant as to how to overcome the particular problem of supplying electric current. The gate-end switch-box at which the accident occurred was placed in a temporary position during the operations. The terms of the Regulations were considered. He decided that a flexible cable could be used between the gate-end switch and fuse box and the fan switch, as he was of opinion that these were portable apparatus. It would have been dangerous to have used an armoured cable because of the narrow coal-face. There would have been danger of "kinking." Asked for a definition of portable apparatus, McCann said that all underground plant came within two heads, fixed or portable. Some plant might be portable and not be at the coal-face, but no plant could be fixed and be at the coal-face.

William Kerr Christie, manager at Blantyreferme Colliery, stated he visited the scene of the accident and saw the gate-end box with the cable lying detached from it. His opinion was that the damage done to the stud and tap hole in the gate-end box was recent. It looked as if the stud had been wrenched out by considerable force. His view was that all the apparatus being used at the time was portable apparatus. It was all being moved as the coal-face advanced. The electrician told him he intended to install a flexible cable between the gate-end box and the fan switch, and he agreed with this proposal.

William Mitchell, assistant electrician, spoke of examining the gate-end box on February 18th and testing the cables and finding them secure. After the accident he examined the gate-end box and saw that the threads in the tap hole had been recently stripped. He did not think one blow from the pan conveyor could make the stud come loose. His view was that a pan must have originally fallen on the stud and slackened it, and then the blow on the box on the day of the accident caused the stud to fall out.

Robert Alexander Moore, a director of the company, said the directors took an active part in the commercial side, but not in the technical side. They had no knowledge of whether a flexible cable was secured to the fan switch. They took all reasonable precautions by publishing the Regulations at their collieries.

The last witness for the defence, Robert Rogerson, mining engineer, Glasgow, gave it as his view that any electrical apparatus being used in close proximity to the working face and which was to advance as the face advanced was portable. Counsel then addressed the Sheriff.

Giving his decision, the Sheriff acquitted A. G. Moore & Co., the owners of the colliery, finding them not guilty, McCann and Mitchell (electrician and assistant electrician) were found guilty on both charges and fined £10 each, W. K. Christie, the manager, was found guilty on the first charge and fined £10.

Filter Patent Extended

In the High Court of Justice, Chancery Division, on December 2nd, Mr. Justice Simonds delivered judgment upon a petition presented jointly by Stream-Line Filters, Ltd., and Dr. H. S. Hele-Shaw for the extension of two patents for a period of ten years.

Mr. Trevor Watson, K.C., pointed out that the invention was being used by the Royal Air Force, the Admiralty, the Central Electricity Board and other public bodies. It was further stated that the lubricating oil consumed in this country, amounting to an annual total of 150,000,000 gallons, had to be imported from abroad, and as the filter enabled the impurities to be efficiently separated from 95 to 97 per cent. of good oil still remaining this resulted in a substantial measure of public economy.

Mr. Justice Simonds, in the course of his judgment, said that so far as the first patent (No. 210101 of 1922) was concerned the petition must be refused as the patent did not cover more than a development of "edge filters" as known at the date of the grant.

Very different considerations applied in the case of the second patent (No. 210376), which showed great utility to the public. It was of real importance that, by the use of the invention, lubricating oil could be used over and over again at a cost which could be regarded as trivial, having regard to the saving effected. There had been no undue delay in exploiting the patent, and a sum of £70,000 had been expended for that purpose. Stream-Line Filters, Ltd., now appeared, from the balance sheet, to be in a strong position to market the invention. His Lordship said that he was justified in making a re-grant for a term of five years from date of expiration of the second patent.

Compensation Award

Sheriff McDonald, Glasgow, has issued his decision in an arbitration at the instance of an electrician against his employers, claiming compensation from December, 1937, to date and until he has recovered his capacity for work. Claimant met with an accident in the course of his employment in January, 1937, as a result of which he received head injuries and electric shock. After two months he resumed his former employment but was compelled to give it up in December, 1937. It was argued for claimant that his present nervous condition and muscular atrophy were due to the accident. For the employers it was contended that any incapacity the claimant suffered from was constitutional. The Sheriff accepts the evidence of the claimant's doctors and awards compensation.

Patent Appeal Dismissed

In the Chancery Division on December 1st Mr. Justice Simons had before him an appeal by the Westinghouse Electric & Manufacturing Co., Ltd., from an order of the Controller, acting in pursuance of the provisions of the Patents and Designs Acts, refusing the company's petition to be allowed to amend the complete specification of its letters patent No. 368805 for "Improvements in or relating to electric circuit interrupters."

The company acquired the rights in the patent as the assignees of Mr. Joseph Slepian, of Pittsburgh, Pennsylvania, U.S.A., the convention date in the U.S.A. being December, 1929; the application date in the United Kingdom was December 3rd, 1930, and the complete specification was accepted on March 3rd, 1932.

The nature of the invention related to electric circuit interrupters and particularly to electric circuit interrupters of the liquid or oil-immersed type, and the chief object was to supply a gas to the path of the arc established in an electric circuit interrupter for deionising the current-carrying portions of the arc space.

The General Electric Co., Ltd., opposed the proposed amendments, which were many and of a highly technical character, and his Lordship, after hearing counsel, while granting minor ones, stated that the major ones asked for would have, if allowed, the result of substantially altering the whole ambit of the specification, which the Court could not permit. On the whole the petition must be dismissed and the appellants in the circumstances must pay the costs. Judgment was entered accordingly.

Radio Patent Appeal Judgment

The Court of Appeal, consisting of the Master of the Rolls and Lord Justices Scott and Clauson, on December 5th delivered judgment in the appeals by Electric and Musical Industries, Ltd., Marconi's Wireless Telegraph Co., Ltd., Standard Telephones & Cables, Ltd., and the Philco Radio & Television Corporation of Gt. Britain, Ltd., from the order of Mr. Justice Morton in the Chancery Division allowing the Mullard Radio Valve Co., Ltd., leave to amend the specification of its letters patent No. 287958, dated December 24th, 1926, for a particular form of pentode valve.

Mr. Justice Morton granted leave to amend but subject to the terms that no action was to be taken by the Mullard Co. against anybody in respect of the manufacture, sale or resale of any discharge tube manufactured before that date (March 1st, 1938) which would be an infringement of the claim as then amended. The proceedings before Mr. Justice Morton were reported in the ELECTRICAL REVIEW of February 4th, February 25th and March 4th, 1938, and those in the Court of Appeal of July 15th, 1938.

The Court allowed the appeal and discharged the order of Mr. Justice Morton. The Master of the Rolls, in giving judgment, said the subject matter of the specification was a highly technical matter. Having stated the nature of the question for decision he considered that no constructive ingenuity was required to make a valve having two or more electrodes of which two were capable of acting in a particular way if used in a particular manner, and of acting in some other way when used in some other fashion.

His Lordship added that in his opinion the appeal should be allowed and the order of Mr. Justice Morton allowing the proposed amendment discharged. The other members of the Court concurred. Their Lordships, on the application of Mr. Lionel Heald, K.C., for the Mullard Co., granted the company leave to appeal from the judgment to the House of Lords.

Personal and Social

Information regarding new appointments and other matters of interest for this page are welcomed

THE annual dinner and prize distribution in connection with the Electricity Supply Rifle League was held at Maison Lyons, London, on December 3rd, when a company of eighty-seven sat down under the chairmanship of the president of the League, **Mr. S. C. Nodes,** of the London Power Co. Among those present were Messrs. H. P. Gaze (London Power Co.), J. R. J. Bowden (Hackney) and W. Weekes (Shoreditch), past-presidents, and Messrs. M. Farrer (J.E.A., Twickenham) and P. C. Ebner (Shoreditch), vice-presidents. The visitors included Mr. F. W. Purse (J.E.A.). Mr. H. P. Gaze, in proposing the toast to "The Chairman," spoke of his long association with the Rifle League. Mr. Nodes, in reply, mentioned that the London Power Co. might be able to put another team into the League next year. The final leaders in the League are as follows:—Division 1: City "A"; Division 2: City "B"; Division 3: J.E.A.; Division 4: Southmet "A."

Mr. W. E. Wicks, A.M.I.E.E., deputy borough electrical engineer at Bexley, has been appointed borough electrical engineer in succession to Mr. A. J. Abraham, who is retiring at the end of this year. Mr. Wicks received his early training under Mr. L. C. F. Bellamy at the Ilkeston Corporation Electricity and Tramways Department, and went to Bexley twenty-four years ago.

Mr. W. E. Wicks

Mr. E. J. Williams, M.I.E.E., district manager of Edmundsons Electricity Corporation, Ltd., and managing director of the Isle of Wight Electric Light and Power Co., Ltd., sails on the *Athlone Castle* on December 22nd for an extended tour of South Africa and Rhodesia. Mr. Williams, who will be accompanied by Mrs. Williams, expects to be away until about the middle of March.

Mr. P. F. Rowell, who has been secretary of the Institution of Electrical Engineers for many years, is retiring at the end of August next, and the Council of the Institution is advertising in our pages to-day for his successor. The commencing salary will be not less than £1,500 per annum.

Professor J. T. MacGregor-Morris, D.Sc., M.I.E.E., who recently retired from Queen Mary College after forty years' service in the Department of Electrical Engineering, will be one of the four new Fellows of the College to be admitted at the Charter Week reception on December 16th. The College celebrations in honour of the presentation of the Royal Charter by Queen Mary will include exhibitions of work and items of special interest in various departments.

Mr. G. Caton, A.M.I.E.E., has joined the board of directors of the Yorkshire Switchgear and Engineering Co., Ltd., and in addition to all technical matters will devote an increasing amount of his time to the managerial side of the business. In taking up this appointment he has resigned his position as chief engineer of the switchgear department of the Brush Electrical Engineering Co., Ltd. Mr. Caton previously held a similar position with the Harland Engineering Co., Ltd.

The Seecol Social Club (Strand Electric & Engineering Co., Ltd.) held its annual supper and dance at Gatti's Restaurant, Strand, on November 26th. About 250 guests were present. Mr. L. G. Applebee, manager of the Theatre Lighting Department, acted as M.C. and the programme included a cabaret.

Mr. W. T. Griffiths has been presented with a fireside chair from the staff and employés on leaving the meter section of the Tunbridge Wells Corporation Electricity Department to take up a post as meter tester with the Ilkley U.D.C.

Mr. F. Price has been appointed home sales supervisor to Blackstone & Co., Ltd., the position which his father, the late Mr. Tom Price, occupied before becoming a director.

Mr. M. A. Muller has been appointed general manager of the Sparton Refrigeration Co., Wembley (proprietors: Electrical Commodities, Ltd.). He already holds the position of general manager of the household appliances division in the parent company. Mr. Muller has a very wide experience of the electrical industry, having been connected with it for the past fourteen years. The Sparton Refrigeration Co. has also appointed **Mr. A. E. L. Betts** as sales manager. Previously Mr. Betts was connected with H.M.V. Household Appliances.

The annual reunion and dinner of the Old Folkestonians was held at St. Stephen's Club, London, on Saturday last. This Association consists of original members of the staff of the Folkestone electricity works dating back to 1898. Old members not in touch with the Association are asked to communicate with Mr. J. L. Eve, of the J. L. Eve Construction Co., Ltd., 272-4, Vauxhall Bridge Road, S.W.1.

Addressing the guests at the annual dinner-dance of the Hull Sub-section of the Electrical Power Engineers' Association **Principal J. H. Nicholson,** of the Hull University College, said that the formation of such associations at the E.P.E.A. provided not only a protection against anything unfair and unscrupulous, but was also conducive to the improvement of professional standing. Mr. P. S. Jolin, A.M.I.E.E., senior vice-president, said that largely as a result of the Association's work employment had been found for those members thrown out of work by the closing down of smaller power stations. Among the guests present were Mr. D. Bellamy (general manager of the electricity undertaking), Alderman B. Pearlman (chairman of the Electricity Committee), and Alderman F. Holmes (ex-chairman).

Members of the South Coast section of the Electrical Power Engineers' Association held their annual dinner and dance at Warne's Hotel, Worthing, on November 26th. Representatives from towns between Hastings and Bournemouth attended, and the president of the Association was also present.

The Ipswich and District Electrical Association held its fourth annual festival dance at the Felix Hotel, Felixstowe, on December 2nd, when 200 members and friends spent a very enjoyable evening. The gathering included Messrs. H. E. Blackiston (chief engineer and manager, Ipswich Corporation Electric Supply and Transport Departments), N. F. Driessen (president and chairman of the Association), A. E. Knights (resident engineer of the East Anglian Electric Supply Co. at Bury St. Edmunds), S. G. Roper (engineer and manager, East Suffolk Electricity Distribution Co. at Woodbridge), and R. D. Reynolds (Area Officer, British Electrical Development Association). Messrs. G. H. Byron (Metropolitan Vickers Electrical Co.), F. Deane (Edison Swan Electric Co.), C. F. Hitchcock (Flinders, Ltd.)) F. Thirkettle (electrical contractor), and W. H. Howell (Corporation Electricity Department) are to be congratulated on their work in making this function a success.

Obituary

Mr. William Stevenson, M.I.E.E., whose death has occurred in a Glasgow nursing home at the age of eighty-four, was associated for nearly fifty years with the railways in the West of Scotland. He joined the staff in the telegraph superintendent's office, Caledonian Railway, Glasgow, and was appointed superintendent in 1900. Mr. Stevenson was responsible for the

Members of Salford Electrical Instruments, Ltd., at the dinner given in honour of long-service employés, reference to which was made in our last issue

installation of the electro-pneumatic signalling apparatus controlling the Central Station, and the introduction of track circuiting on the Caledonian Railway. He retired in 1920.

Mr. Thomas Henwood, who has died at the age of eighty-four, secured a post with the Brighton Corporation about forty years ago, and after thirty-four years' service he retired from the position of mains superintendent of the electricity undertaking. In 1879 he sailed in the cable ship *Faraday* and helped to lay the French Atlantic cable.

Mr. R. W. Weightman.—We regret to record the death of Mr. Robert Widdowfield Weightman, M.I.E.E., a partner of Preece, Cardew & Rider, consulting engineers, which occurred on December 6th at the age of seventy-one. Mr. Weightman had been a partner in the firm since 1924.

Mr. H. Bannister.—We regret to announce the death which occurred on December 4th, after a short illness, of Mr. Harold Bannister, a member of the construction staff of the Central Electricity Board. Mr. Bannister, who was forty years of age, joined the staff of the Central Electricity Board in May, 1930. Previously he was for eight years in the service of the Yorkshire Electric Power Co., where he gained a wide experience in all matters relating to electricity supply. His theoretical training was obtained at Leeds University and was followed by mechanical and electrical training respectively with the Morley Electrical Engineering Co., Ltd., Leeds, and W. scales, Leeds. He leaves a widow and two children.

Will.—Mr. W. H. Scott, chairman and managing director of Laurence, Scott and Electromotors, Ltd., left £82,950, with net personalty £75,190.

Sir Thomas Callender

Cable-making pioneer's death

THE death of Sir Thomas Octavius Callender, which occurred last Friday night at his home, Bidborough Court, Kent, removes from amongst us one who for between fifty and sixty of his eighty-three years, had been actively and successfully engaged in connection with the British electric cable-making industry.

Sir "Tom," as he was known to everybody, was born in Glasgow in 1855, and was the eldest son of W. O. Callender, with whom he co-operated in the development of the businesses which were to make the family name a household word in every land where electrification took place. The original Callender business, founded in 1877, consisted of an interest in Trinidad bitumen which was used for road-making and kindred purposes, and it was while in Russia on behalf of Callender & Sons that Sir Tom's attention was drawn to the new electrical illumination that had just emerged, and its future possibilities. This was in the year 1880 when the Jablochkoff candle and other electric lighting devices were paving the way for great changes. He saw a certain future for electric lighting, and an opportunity for developing the use of bitumen as an insulator for electric light and power cables. In October, 1881, letters patent were granted to his father for "Improvements in the manufacture of telegraph conductors and materials for covering and insulating wire or other conductors used for telegraph, electric, or similar purposes." The experience gained in road-making proved of great value to the concern later when underground cables were made and laid.

The late Sir Thomas Callender

For the purpose of developing the 1881 patent, Callender's Bitumen Telegraph & Waterproof Company was established in 1882 with Sir Tom as manager. There are still amongst us those who recall the long hours which he put into the business in the immediately following years when the offices were in Leadenhall Street, E.C. Fourteen years later, the volume of trade had grown to such proportions that a reorganisation took place and in July, 1896, the company with the name by which it is still known—Callender's Cable & Construction Co., Ltd.—was formed with a share capital of £100,000. The "manager" of the old company then became "managing director" of the new, and that title and office Sir Tom held right down to the last—42 years.

Even before these things occurred Britain had already made for herself a great name as *the* maker of submarine telegraph cables. It has always been gratifying to remember that pioneering work in that department was followed by the exercise of similar British initiative and enterprise in the design and production of power cables. The foundations were early laid of what was to become a commanding business in this field, growing from year to year through impressive enterprise and specialised organisation into the large and world-renowned British cable-making industry of to-day. One cannot glance back over the past fifty years without recognising that Sir Tom Callender was one of our most eminent and influential personalities, while he was also the last of the original workers, in this special branch of the electrical industry.

One of the most interesting chapters in his life would relate his achievements as an overseas business ambassador. For many years he was almost ceaselessly engaged in such capacity. His activities not only brought large business to his own company, but they were the means of opening up trade channels which had a considerable influence on the British electrical industry. His remarkable zeal continued until a year or two ago in spite of his advancing years.

Like some others who could be named as being responsible for the continuous growth of our industry he possessed a striking presence and personality which stood him in good stead in many of his operations. We may describe him as one of the outstanding examples of the men—and our industry has had not a few such in its time—who were fully convinced of the necessity for the heads of business—principals or directors or high officials armed with ample authority—to visit in person, and not once but many times, our overseas markets.

The Callender organisation, while it has been active overseas and on the Continent, has, of course, spread its influence very substantially over home electrical enterprises during the whole of its existence. This may be briefly indicated by mentioning that, while he was deputy chairman and managing director of Callender's, Sir Tom was also a director of three of the big power companies—the Lancashire, the Yorkshire, and the Scottish; chairman of the Herne Bay & District Electric Supply Co.; chairman of St. Helen's Cable & Rubber Co.; and a director of the Anchor Cable Co., the Enfield Cable Works, W. T. Glover & Co., Ltd., and Thomas Bolton & Sons, Ltd. His other directorships related to supply and manufacturing organisations connected with India, Egypt, East Africa, South America, the Sudan, the Near East, and the U.S.A.

He was knighted in 1918 in recognition of public work and services to the nation. He was a member of the I.E.E. and a vice-president of the British Industries Federation; but particular mention should be made of his work in connection with the development of the Cable Makers' Association. He was the last survivor of those present at the dinner held in Westminster in January, 1900, to mark the foundation of that organisation. That he was a keen stamp collector and an enthusiastic photographer was in keeping with his love for travel. He was a Senior Warden of the Electrical Industries Benevolent Association and a member of the Council; a week or two before his death he sent a donation of £500 to the Association. It will be recalled that Lady Callender (to whom he was married in 1885 at Erith) predeceased him by six months. Their only son, Mr. T. O. Callender, A.M.I.E.E., C.C., served in the War and is a director of the company.

The memorial service, which takes place to-day, Friday, at 12.30 p.m., will be held at St. Clements Dane, Strand, W.C., where in March, 1935, Sir Tom and Lady Callender celebrated their golden wedding. The interment took place yesterday, Thursday afternoon, at Erith Parish Church.

Mr. Ernest E. Sharp, president of the E.I.B.A., has sent us the following appreciation:—

Sir "Tom" Callender's interest in the Electrical Industries Benevolent Association was sincere and long-standing, and he always dealt personally with any matters with which it was concerned. Only a fortnight ago, when making a deed of covenant arranging for continued substantial support of the Association's funds for a further period of seven years, he characteristically wrote: "I am getting on to one of the old stagers of the industry, being now well advanced in my eighty-third year; but I can only live in the hope that I will see the end of the covenant to which I now agree; and if I happen to be otherwise engaged there will be no doubt that any obligations under the covenant will be duly attended to. All good wishes to you and those who are doing such good work for the Association." His death will be a great loss to the E.I.B.A. and to those on its committees with whom he laboured in the interests of the men and women in all branches of the electrical industry.

Commercial and Industrial News

Hull to Leave I.M.E.A. Compulsory Registration. Smithfield Show. Heat Treatment Research Laboratory. Highlands Water Power. Snow-making Plant.

Hull Withdraws from I.M.E.A.

Following a statement by the Town Clerk (Mr. A. Pickard), the Hull Electricity Committee has decided to withdraw from membership of the Incorporated Municipal Electrical Association. Mr. Pickard informed the Committee that according to the articles of association the authority must be represented by one member of the Committee and the engineer. The general manager was not an engineer and when the matter was raised at the last meeting it was decided that he, Mr. Pickard, should communicate with the secretary of the I.M.E.A. and inform him that unless the Association was prepared to alter its articles so that the general manager became eligible for appointment, the Corporation would have no alternative but to withdraw from membership. A reply had been received stating that such action could not be taken.

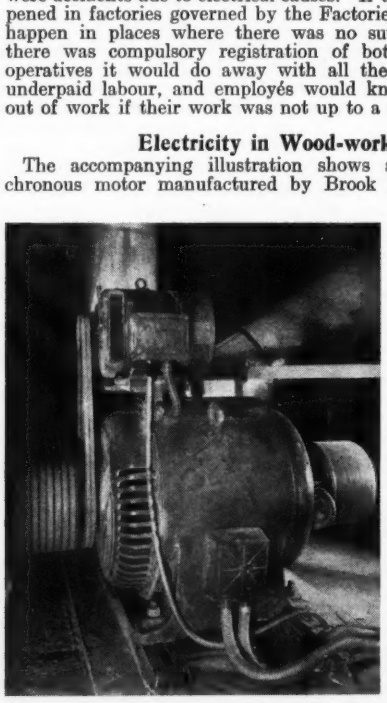
Alderman Holmes said that the only course was to leave the Association. They would gradually find other towns doing the same. Alderman B. Pearlman (chairman of the Committee) said that withdrawing from the Association would not solve the problem. The only remedy, in his opinion, was for local authorities to get together and decide whether it was not time to have another body apart from the engineers to represent the undertakings.

Contractors and Compulsory Registration

That in order to obtain a better standard of workmanship in the electrical industry there should be compulsory registration not only of employers but also of operatives, was the view expressed by Mr. Walter Riggs, the President of the E.C.A., speaking at the annual dinner of the Newcastle branch on November 30th. Mr. R. W. Leek, of Newcastle, presided. Lieut.-Col. S. E. Monkhouse, of the North-Eastern Electric Supply Co., Ltd., proposed the "E.C.A.," and said the old hit and run methods of business had gone but something remained to be done to raise the standard of workmanship. If they were to be allowed to expand along peaceful lines they must cease to be the pawns of politicians. He did not mean by this that he was opposed to ending the present muddle of distribution, nor would he enter into the controversial question of public *versus* private enterprise. Both had their places in the scheme of things. The registration of contractors, he stated, had had a marked effect on improving conditions. Mr. W. Riggs, replying, said that work done in factories was governed by a code of working rules but in spite of this there were accidents due to electrical causes. If these accidents happened in factories governed by the Factories Acts what would happen in places where there was no such legislation? If there was compulsory registration of both contractors and operatives it would do away with all the trouble regarding underpaid labour, and employés would know they would be out of work if their work was not up to a certain standard.

Electricity in Wood-working

The accompanying illustration shows a 60-HP autosynchronous motor manufactured by Brook Motors, Ltd., and installed in conjunction with a Matthews and Yates cyclone plant at the works of William Lindsay & Son, Ltd., Canonmills Cooperage, Edinburgh. The motor is driving a high-velocity suction plant which extracts the oak chips from the woodworking plant throughout the works. The motor raises the plant p.f. from 0.65 to 0.95 lagging. It is of the cylindrical rotor type, with DC supply to the rotor. The exciter is mounted above and driven through vee-belts. Control is from standard Ellison oil immersed switchgear. This entire plant has been recently modernised and over 250 HP of Brook surface cooled totally enclosed motors are now used. The electrical installation was carried out by Pratt Bros., Ltd., of Edinburgh.



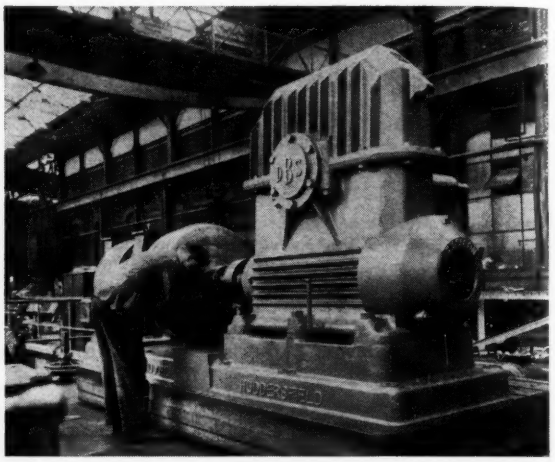
A 60-h.p. Brook motor driving suction plant at a woodworking mill

Order for Street Lighting Lanterns

The North Eastern Electric Supply Co., Ltd., has placed an order with the General Electric Co., Ltd., for the supply of 119 side-mounting "Di-fractor" lanterns complete with "Osira" lamps and the necessary equipment for a new street lighting scheme at Hebburn-on-Tyne. In addition to these, 550 directional reflectors of various types have also been ordered for the lighting of secondary streets.

Large Speed-reduction Units

The two largest "Radicon" worm reduction units ever made have recently been completed in the works of David Brown & Sons (Hudd.), Ltd., Huddersfield. They are types RHU and RHO and are of 24-in. and 28-in. centres respectively. These units are required for driving linoleum machines. The RHU type (shown in the accompanying illustration) will transmit 150 HP while reducing speed from 970 to 38.87 RPM, and the RHO type will transmit 100 HP while reducing speed from 1,100 to 17 RPM.



A 24-in. "Radicon" worm reduction unit for driving linoleum machines

Electrical Engineers' Ball

As already announced, the next Electrical Engineers' Ball will be held at Grosvenor House, Park Lane, W., on February 10th (8.30 p.m. for 9 p.m., supper 11.30 p.m., carriages 3 a.m.), the day after the annual dinner of the Institution of Electrical Engineers. Tickets for the ball, which will be organised on the same lines as last year, are now available and can be obtained (one guinea each), from members of the General Committee, who number seventy-nine, and who include the members of the Committee of Management of the I.E.E. Benevolent Fund, under whose auspices the ball is managed. The Executive Committee is as follows:—Dr. A. P. M. Fleming and Mrs. H. P. Gaze, W. G. Hendrey, C. W. Hill, J. M. Kennedy, J. W. Leach and J. W. J. Townley.

United States Electrical Exports

The exports of electrical machinery from the United States during September attained a value of £1,459,800, making the total exports for the first nine months of the current year £15,027,000, as compared with £16,674,800 in the corresponding period of 1937.

The Smithfield Show

While there is much of electrical interest to be seen at the Smithfield Club's Cattle Show, now being held at the Royal Agricultural Hall, Islington, it is rather disappointing to find that the electrical appliance that is probably the butcher's greatest friend, namely, the refrigerator, is so poorly represented. For the past few years there have been regularly about seven or eight manufacturers exhibiting, but this year the only stand devoted exclusively to refrigeration equipment is that of the Express Refrigeration Co., one other piece of apparatus, a "Superfrigor" cold room, being seen among Herbert & Sons' display. Maybe the reason for this is that every butcher now has his premises fully equipped with cold-rooms, refrigerators, display counters, &c.! The tendency towards streamlining and the removal of all protruding corners is very noticeable in the latest designs of sausage machines, bowl cutters, &c., examples of which are shown by the Alexander Manufacturing Co., Herbert & Sons, the Hobart Manufacturing Co., the Peerless Electrical Manufacturing Co., the Silent Machine & Engineering Co., and J. C. Wetter & Co.

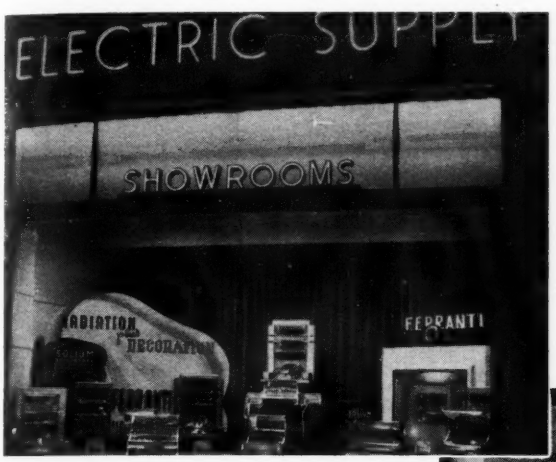
On the farm the use of electricity, particularly for small portable apparatus, is often prevented by the lack of a mains supply. Considerable interest is therefore being taken in small petrol driven generating sets. To eliminate the danger of freezing in cold weather R. A. Lister & Co., have just brought out a low-priced range of air-cooled engines in four sizes from 1 to 16 h.p. Air-cooled engines suitable for

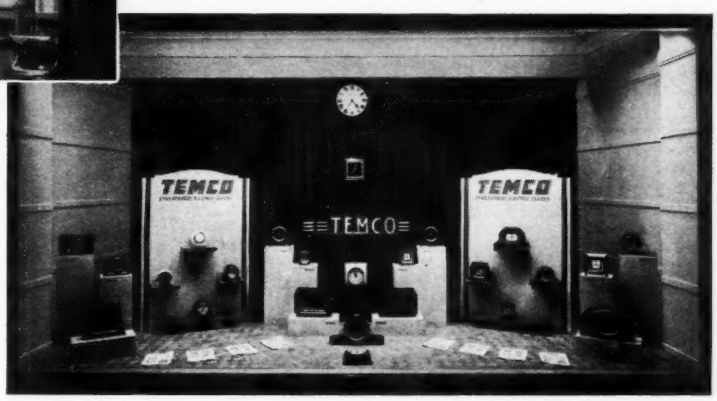
numerous farming duties are also to be seen on the Petter stand direct-coupled to centrifugal pumps, other Petter exhibits including lighting sets and both fixed and portable Diesel power units. A new Diesel-electric lighting set representing a range from 1¾ to 25 kW is shown for the first time by Ruston & Hornsby, whose display also comprises petrol lighting sets, a vertical cold starting oil engine, horizontal units, and pumps.

Dairy farmers are rapidly learning to appreciate the advantage of electric milking machines such as Gascoigne's (Reading), the International Harvester Co. of Great Britain, Vaccar, J. & R. Wallace, and Alfa-Laval supply, while both Aveling-Barford and Perkins Clean Milk Equipment report a growing demand for electric sterilisers, bottle washers, milk cooling plant, &c.

Two Window Displays at Birmingham

In the accompanying illustrations we show two displays which have recently been arranged in showroom windows of





Two window displays at the Birmingham electricity showrooms showing (top) Ferranti fires and (below) "Temco" synchronous clocks

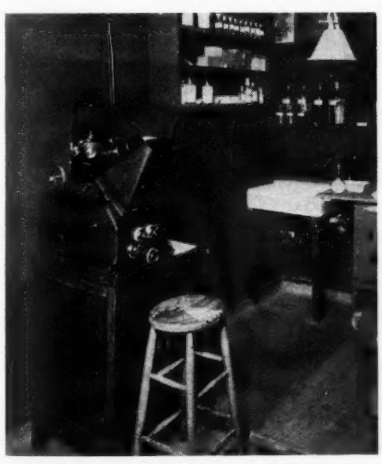
the Birmingham Corporation Electric Supply Department. The top illustration shows a display of Ferranti fires, and the new background which is available this season is shown on the left-hand side of the window. The other picture shows a "Temco" (T.M.C.-Harwell (Sales), Ltd.) synchronous clock display, and is made up of two of the company's type "B" units.

An Unusual Race Trophy

One of the recent fixtures at the Celtic Park dog-racing track at Belfast was the competition for the "Union Lamp Trophy," the final of which was held on November 25th and won by Peter the Piper. Organised by the National Greyhound Racing Co., Ltd., the race was for a purse of £75 and a trophy in the shape of a table lamp made by F. H. Pride, Ltd., of Clapham. The profits from the event were allocated to the Belfast Coal Relief Fund.

Heat Treatment Research

To improve still further the service to their customers Wild-Barfield Electric Furnaces, Ltd., have just opened special heat-treatment research laboratories at 459a, Caledonian Road, Holloway, N.7. Accordingly the company is able to extend its facilities whereby prospective purchasers of electric furnaces can submit specimens of metals to be heat treated so as to ensure that they obtain equipments most suitable for their requirements and, conversely, that they use the correct metals for particular purposes. After-purchase advice is also freely given. The upper portion of the laboratories is divided into two main sections for metallurgical testing and chemical work. In the former hardness of metals can be calculated in terms of the ratio load/impressed area by means of the latest type of Vickers pyramid hardness testing machine, while a Houndsfield tensometer testing machine is available for tensile, notched bar, slow bend, compression, cupping, punch sheet and Brinell hardness tests. There is also a Houndsfield balanced impact machine. A special bench is set aside for grinding and polishing samples for microscopic examination, photomicrography, &c., which are carried out in a special optical dark room, the equipment of which includes a Browning spectroscope and a Vickers projection microscope which is fitted with both "Point-o-lite" and carbon arc illuminants and can also be used with polarised light. Furnaces of the company's own construction are employed in the chemical laboratory. They include a solder bolt heater; a rectangular laboratory muffle furnace for general purpose work up to 1,000 deg. C.; small tubular muffle furnaces for general chemical and metallurgical analysis, *e.g.*, carbon combustion; and a thermostatically controlled oven for temperatures up to 200 deg. C. Other electrical equipment comprises hotplates and an electrically heated still for the production of distilled water.



The Vickers projection microscope at the new Wild-Barfield laboratories

Modern Works Lighting

With reference to the description of the lighting installation at the new engineering and body works of Express Motor & Body Works, Ltd., Enfield, which was published in our issue of November 25th, the Revo Electric Co., Ltd., informs us that the lighting reflectors used for this installation are of its manufacture.

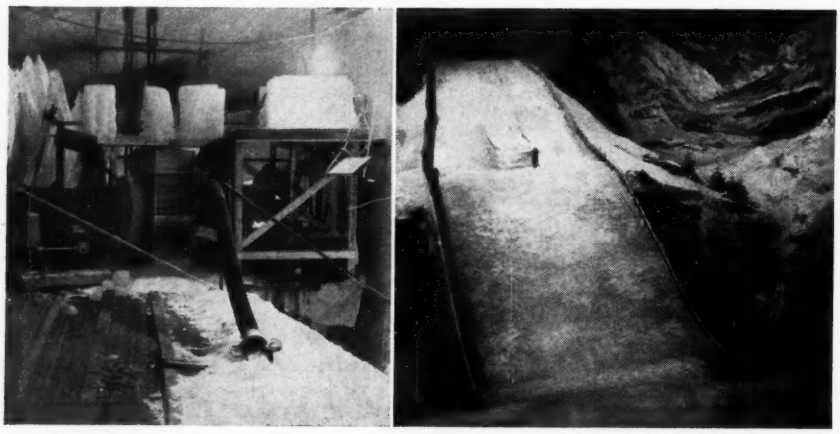
An Exporters' Guide

The "International Mercantile Diary & Year Book" for 1939 (Syren & Shipping, Ltd., 12s. 6d. net), which is now published, forms a useful guide to all concerns engaged in the export and import trades. The features of previous editions have been retained and the whole of the information given has been revised in accordance with the latest developments. The "Postal Information" sections under the various countries have been extended to include the length of time taken by letters and parcels to reach their destination. The freight calculation tables which were a popular feature some years ago have been revived, while other information in the general section has been extended. Another innovation is a list of abbreviations used in French and German business correspondence, with translations. The "Merchant Shipper," the free supplement which keeps the Year Book up-to-date will, from this year, be published monthly instead of quarterly.

Water Power in the Highlands

The Committee on the Highlands and Islands appointed by the Scottish Economic Committee in 1936 "to examine economic conditions in the Highlands and Islands and the possibilities of development of local industries therein" issued its report on November 28th. Dealing with water power in the Highlands the report states that the region possesses a latent asset of very great potentiality in the enormous amount of water which is at present unutilised. The altitude of the greater part of the Highlands, the many lochs and the high average rainfall combine to make this part of Great Britain by far the greatest source of water power in the British Isles. Reference is made to investigations carried out and surveys of possible water-power developments made by experts, to the work of the British Aluminium Co., and to the Caledonian Power Scheme. Summarising the report, the Committee state: "We contemplate that one of the first duties of the Development Commissioner (whose appointment is recommended) will be a review of the industrial position in order to ascertain the extent to which utilisation of water power can assist in the general scheme of development. We are of opinion that as far as possible this should be directed towards applying electricity for domestic and agricultural purposes, and to industries established or to be established within the Highlands, and not for power production for transmission to southern areas. The provision of such facilities should primarily be directed towards giving employment where labour is available." The Committee recommends that: (1) Local or county authorities, or private enterprise, should be vested with

powers to authorise or develop water-power schemes for local use subject to the approval of the Electricity Commissioners. (2) Government assistance for the developing of schemes should be available to the extent of providing guarantees against loans covering the greater part of the expenditure. (3) Encouragement should be given to any industry willing to develop water power for utilisation in the Highlands. (4) In the event of the appointment of a Development Commissioner, one of his first duties should be the investigation of possible industrial developments, with special reference to water power, with a view to the introduction of industry to centres where employment is required. (5) Simplification of the present expensive and involved procedure necessary for the promotion of water-power schemes should receive consideration. (6) In any revision of the rating laws affecting Scotland, special attention should be given to the method of rating hydro-electric developments in order to bring it into line with the rating of stations where power is produced by means other than by the use of water.



Indoor ski-ing at Earls Court showing (left) the snow-making plant and (right) the ski run
[Elec. Rev. photos.

Calendars and Diaries

British Insulated Cables, Ltd., has sent us its calendar for 1939, which is similar to those of preceding years. Below the monthly sheets for the current, preceding and following years there is an at-a-glance calendar for the whole of each of the three years.

The lady who adorns the calendar received from Mr. Christopher Wade (Gabriel Wade & English, Ltd.), maintains the standard set by this company. The title of the picture is "Memories," and it is from a painting by Albert H. Collings, R.I.

The diary of the Electrical Power Engineers' Association is bound in dark blue leatherette, and in addition to the usual diary information contains tables and data of value and utility to members in their daily avocations.

The neat pocket diary received from the Telegraph Construction and Maintenance Co., Ltd., has a maroon leatherette binding with a clip to keep it closed and an oval-shaped pencil which is held inside by a metal clip. A number of squared sheets adds to the usefulness of the diary.

I.E.E. (North-Western Centre)

The annual dinner of the North-Western Centre of the Institution of Electrical Engineers will be held on January 17th at the Midland Hotel, Manchester. Tickets (10s. 6d. each) can be obtained from Mr. L. H. A. Carr, hon. secretary of the Centre, "Oakleigh," Cambridge Road, Hale, Ches. Students and graduates (under twenty-eight years of age) must obtain their tickets (7s. 6d. each) from the students' hon. secretary.

Trade Announcements

Brown Brothers, Ltd., have purchased the stock and premises of Attwoods (Factors), Ltd., of Fryer Street, Wolverhampton, and intend to carry on the business as a Brown Brothers branch. Mr. H. J. Attwood, the former proprietor of the business, has been appointed branch manager. Mr. J. D. Soulsby, for several years at the Manchester branch, has been appointed assistant manager at Wolverhampton.

The telephone number of the Rheostatic Co., Ltd., has been changed to Slough 23311-4.

Public Lighting Conference at Cardiff

An E.D.A.-E.L.M.A. Public Lighting Conference was held at Cardiff on Wednesday last under the chairmanship of Ald. A. E. Gough. Invitations had been sent to all mayors, chairmen of Councils, members of Lighting Committees, town clerks and surveyors throughout South and West Wales. Mr. C. R. Bicknell spoke on "The New Era in Electric Lighting" and gave an outline of the recent developments in tungsten filament and electric discharge lamps, with demonstrations. A discussion opened by Mr. A. D. Ridley, of Tenby, followed, and after tea at the Park Hotel a tour of inspection was made of street lighting installations.

Electrical Exhibition at Mossley

The Stalybridge, Hyde, Mossley and Dukinfield Joint Transport and Electricity Board, assisted by leading electrical appliance manufacturers, last week held an exhibition of electrical appliances at the Technical School, Stamford Road, Mossley. On the platform in the main hall was a complete model kitchen and a working model bathroom. Exhibitors included: Hotpoint Electric Appliance Co., Ltd.; Simplex Electric Co., Ltd.; General Electric Co., Ltd.; British National Electrics, Ltd.; Santon, Ltd.; Hoover, Ltd.; Burco, Ltd.; Ferranti, Ltd.; and James Engineering Co. (Mossley).

Making Snow by Electricity

Indoor ski-ing on snow made from ground ice is London's latest spectacular entertainment which, until January 25th, is to be seen at Earl's Court. For "Winter Cavalcade," as the show is called, 250 tons of ground ice are required to cover the 100-ft. jump to a depth of 1 ft., and the arena at the bottom to a depth of 8 in. Grinding of the ice is carried out by means of two machines operating somewhat on the principle of cattle cake crushing machines, and incorporating revolving drums with spikes set obliquely around them. The smaller of the machines, which is situated at the top of the jump, is driven by a 10-HP, 1,450 RPM squirrel-cage motor, and can deal with 20 tons of ice an hour. The other machine, which has a 20-HP motor and handles 30 tons an hour, is portable and is provided with a flexible hose enabling the "snow" to be projected to wherever it is required in the arena. The electric motors are fitted with thermostats which automatically stop them in case of overload or too frequent starting, and permit them to start again as soon as they have cooled down. No system of cooling is provided to keep the snow from thawing, so that 50-70 tons have to be replaced each day. The melted snow is drained off through the matting which forms the floor covering.

Lamp Manufacture in Palestine

Palestine's first electric lamp factory is to be set up at Tel Aviv shortly by the Société d'Industries Electriques d'Egypte under Mr. J. Hachamoff. This concern, which started production in Egypt ten years ago, now supplies 65 per cent. of the lamps used in that country, making 5,000 lamps daily and exporting to Syria, Cyprus, India and other eastern countries. A £10,000 plant is planned for Palestine, beginning with the yearly production of one million domestic and street lamps of 10 W to 200 W and guaranteed for 1,000 hours. Prices, it is stated, are to be lower than for imported lamps, many of which come from the United Kingdom. Imports of lamps by Palestine in 1937, from all countries, totalled 643,000, with a value of £16,221.

An effective window display by the G.E.C. at Magnet House, Kingsway, W.C., showing the company's new automatically controlled electric cooker

Prices of Materials

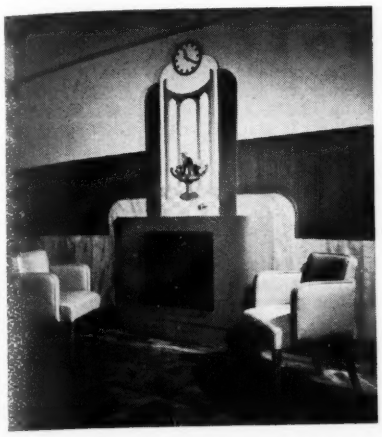
Henry Gardner & Co., Ltd., report, December 7th: Copper bars (best selected), sheet and rod, no change. English pig lead, £17 5s., 15s. decrease. Spelter, £13 8s. 9d., 5s. decrease. English block tin, £213 10s., £1 decrease. Mercury, no change.

Frederick Smith & Co., report, December 7th: Electrolytic copper bars, no change. Ditto, ditto, wire rods, no change. Ditto, ditto, h.c. wire, no change. Silicium bronze wire, no change.

Edward Till & Co., report, December 7th: India-rubber, Para fine, 7½d., ½d. decrease.

Bakelite in Building Design

The possibilities of bakelite materials for interior decoration purposes are effectively demonstrated by their lavish use in both veneer and wall panel forms at the new offices to which Bakelite, Ltd., has just moved at Hobart House, 40, Grosvenor Place, S.W 1 (telephone Sloane 9911). Occupying a floor area of approximately 11,000 sq. ft., the offices are grouped in two main corridors at right - angles. Semi-circular display cases in the main vestibule indicate the ability of the veneers to accept a relatively sharp radius without cracking, while contrasting treatment of the two waiting - rooms emphasises the wide range of attractive colourings available for wall panels. A good example of inlaid bakelite veneer panels is to be seen in the board room symbolising the company's Birmingham works, the design surmounting a "Thermo-vent" heater, the case of which is of bakelite. A further application of the veneers is to be found in the surfaces of a number of the tables. A film prepared by the company entitled "On the Surface" shows that pre-fabricated wall or skirting panels can be easily slipped into position by the use of a system of "secret" fixing.



Not only the convection heater and the clocks, but also the veneer wall panels are of "Bakelite" in the secretary's office at the new Grosvenor Place premises of Bakelite, Ltd.

New Catalogues and Lists

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, 17.—A loose leaf catalogue of fractional horse-power motors giving details and illustrations of all types, including washing machine and refrigerator motors.

British Xylonite Co., Ltd., Hale Lane, London, E.4.—A booklet describing the uses and manufacture of "Xylonite" celluloid, "Bexoid" cellulose acetate, "Lactoid" casein plastic, and "Bexone" synthetic resin. In January 1st next the company will act as a holding company owning all the shares in B.X. Plastics, Ltd., and Halex, Ltd.

British Insulated Cables, Ltd., Prescot.—Leaflets dealing with large and small indoor terminal boxes.

Time Switches & Instruments, Ltd., 120, Victoria Street, London, S.W.1.—Details of electric resistance thermometers.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—Pamphlets dealing with immersion heaters, swimming bath heating, automatic and rapid isolation of faults in supply systems, a multi-contact tripping relay and Holmes arc-welding equipment.

Euston Manufacturing Co., Ltd., 56/60, Grove Road, Walthamstow, London, E.17.—A catalogue of domestic electric lighting fittings.

Marconi's Wireless Telegraph Co., Ltd., Electra House, Victoria Embankment, London, W.C.2.—A booklet describing a new modulated continuous wave transmitter for use in connection with coastal beacon services.

Hopkinsons, Ltd., Huddersfield.—A leaflet describing control cubicles, panels and desks.

M. & C. Switchgear, Ltd., Kelvinside Works, Kirkintilloch, Glasgow.—Pamphlets describing AC contactor starters for slip-ring and squirrel-cage motors.

Private Arrangements

Electrical Services (Northwood), Ltd.—An informal meeting of the creditors was held recently, when a statement of affairs was submitted showing liabilities of £2,315. The net assets were £197, leaving a deficiency so far as the creditors were concerned of £2,118. The company, it was reported, was formed in August, 1937, with a nominal capital of £300, of which £15 had been issued for cash. The cash creditor was a director of the company and he had also guaranteed the bank overdraft. He intimated that he was willing to withdraw his claim until the creditors had received 5s. in the £. It was decided that that offer should be accepted.

W. A. Smith, trading as Electrical & Radio Services, 489, Blackburn Road, Bolton.—The creditors met recently when a statement of affairs was submitted showing ranking liabilities of £1,254. The net assets were £654, leaving a deficiency of £600. It was hoped that a scheme of composition might be formulated and for the protection of the estate it was decided that the debtor should execute a deed of assignment to Mr. A. T. Eaves, of Harry L. Price & Co., 47, Mosley Street, Manchester, with a committee.

Bankruptcy Proceedings

F. W. Ames, 73, Havelock Road, lately carrying on business at 20, Longford Road, Bognor Regis, electrical engineer.—The first meeting of creditors was held on December 2nd at the Official Receiver's offices, 8, Old Steine, Brighton, when the statement of affairs disclosed liabilities of £333, with assets of 10s. 6d., and a deficiency of £332. Debtor attributed his failure to keen competition and bad trade. The case being a summary one was left in the hands of the Official Receiver as trustee.

H. White, Ridgeway Lane, near Ambergate, and lately carrying on business at 38, Nottingham Road, Ripley, both Derbyshire, radio and electrical engineer.—The public examination of this debtor was resumed recently at the Court House, 20, St. Peter's Churchyard, Derby. At the previous hearing it was stated that the unsecured liabilities amounted to £1,148, and there was a deficiency of £282. Debtor said that there had been considerable losses on hire-purchase sales owing to returns from defaulting customers. The examination was closed.

F. H. Bennett, radio dealer, 52, Oaklands Road, Ilford.—First meeting December 9th at 29, Russell Square, London, W.C.1. Public examination January 4th at the Shire Hall, Chelmsford.

L. Cole (Netherfield Radio Stores), radio and electrical engineer, 5, Victoria Road, Netherfield.—Public examination January 5th at the County Court House, Nottingham.

S. S. West and **L. A. Brown** (Webro Electrical Contractors), electrical engineers, 41, Goodge Street, London.—Trustee, Mr. C. B. Park, Carey Street, W.C.2, Official Receiver, released November 19th.

O. G. Lamb, electrician, 26, St. George's Road, Great Yarmouth.—Receiving order made November 29th on debtor's own petition.

A. T. Burden (Meth-Lac Works), electrical engineer, Upper Devizes Road, Salisbury.—Receiving order made November 28th on debtor's own petition.

G. A. Glazebrook (Coventry Electrical and Wireless Supplies), radio engineer, 27a, Victoria Street, Coventry.—Discharge suspended for six months until April 26th, 1939.

Company Liquidations

British Blue Spot Co., Ltd., Sterling Works, Dagenham.—The first meetings of creditors and shareholders under the compulsory liquidation of this company were held on December 2nd at Carey Street, W.C., before Mr. C. W. Bird, Assistant Official Receiver. The company was registered as a private company in August, 1929, with a capital of £100, increased in April, 1930, to £80,000, and was formed to manufacture loudspeakers known as the "Blue Spot," which had previously been manufactured by Ideal Works A.G., of Berlin, F. A. Hughes & Co., Ltd., were appointed sole concessionaires for the Ideal Works and this company (British Blue Spot Co.) was formed to acquire the benefit of the "Blue Spot" business and the interest in the trade mark "Blue Spot." The consideration for the business was £50,000 in cash. The company entered into an agreement with the Benjamin Electric Co., Ltd., to manufacture the loudspeakers and wireless components generally. In June, 1932, that agreement was ended and a new agreement was entered into with C.A.V. Bosch, Ltd. In November, 1934, Mr. John Ismay, managing director of Ismay Industries, Ltd., joined the board of directors and took over control and carried on the affairs of the company. The contract with C.A.V. Bosch, Ltd., came to an end in December, 1934, and Sterling Works (Dagenham), Ltd., took over the manufacture of the sets. Money was raised on the security of debentures and on October 18th, 1938, Mr. H. H. Rose was appointed receiver for the debenture holder. The draft statement of affairs shows unsecured liabilities of £4,592, preferential claims for income tax £792 and debentures £11,311. The assets are valued at £4,521 and consist almost entirely of book debts. The liquidation was left in the hands of the Official Receiver.

Glicks Radio, Ltd., 47, St. Mary Street, Cardiff, radio and electrical dealers.—The statutory meeting of the creditors was held on November 25th at the offices of Poppleton & Appleby, 35, Windsor Place, Cardiff, when Mr. H. Glick, a director of the company, occupied the chair. The statement of affairs showed that the assets were estimated to realise £570, but they were subject to preferential claims of £145 and debentures of £805. There was a deficiency as regarded the debenture holders of £380, and there were no assets available for the unsecured creditors. The issued capital of the company was £225, and as regarded the shareholders there was a deficiency of £10,267. There was a footnote to the statement to the effect that there were contingent liabilities in respect of unexpired leases and financed hire-purchase transactions. The creditors decided that the voluntary liquidation of the company should be continued with Mr. L. S. Findlay, of Poppleton & Appleby, as liquidator. A committee was also appointed.

Terry's Wireless, Ltd.—Winding up voluntarily. Liquidator, Mr. F. Phillips, 329, High Holborn, London, W.C.1.

Cookham & District Electricity Corporation, Ltd.—Meeting December 30th at 15, York Buildings, Adelphi, London, W.C.2, to receive an account of the winding-up by the liquidator, Mr. E. G. F. Cartwright.

Receiver Released

Britannia Switchgear & Electrical Equipment Co., Ltd.—R. H. Fowler, of 141, Moorgate, E.C., ceased to act as receiver and/or manager on October 5th, 1938.

Dissolution of Partnership

Laycock & Ridding, electrical contractors, Goulbourne Street, Keighley.—Messrs. J. Laycock and L. S. Ridding have dissolved partnership. Mr. Laycock will attend to debts and carry on the business.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

KINGSGATE percolator.
AEREX fan.
S.F.B. fuse.
CYNGLO or CONTI-GLOW illuminated sign.

Electricity Supply

Lighting, Domestic, Power

Aberystwyth.—EXTENSION.—The Town Council is to extend the mains to the top of Rhiw Shon Saer.

Accrington.—NEW EQUIPMENT.—A sum of £12,026 from the net profits of the electricity undertaking is to be spent as follows: meters, £1,584; sub-station, £1,726; and services, £8,716. A new sub-station is also to be erected at Broad Oak calico works at a cost of £690.

Ashford.—BETTER LIGHTING.—Improved lighting is proposed for High Street, Ashford, from Castle Street to North Street, and the Urban District Council is to receive estimates from the electricity and gas undertakings.

Atherstone.—SUPPLY FAILURES.—At a recent meeting of the Rural District Council Mr. C. Gisbourne complained that the village had been in darkness on many occasions during the last week or so, and he considered that the Council should do something to get the supply company to put its cables underground. Mr. A. C. Summers said that every time there was a gale they had no electric light.

Barking.—SUB-STATION.—The County of London Electric Supply Co., Ltd., is to erect a sub-station in Axe Street.

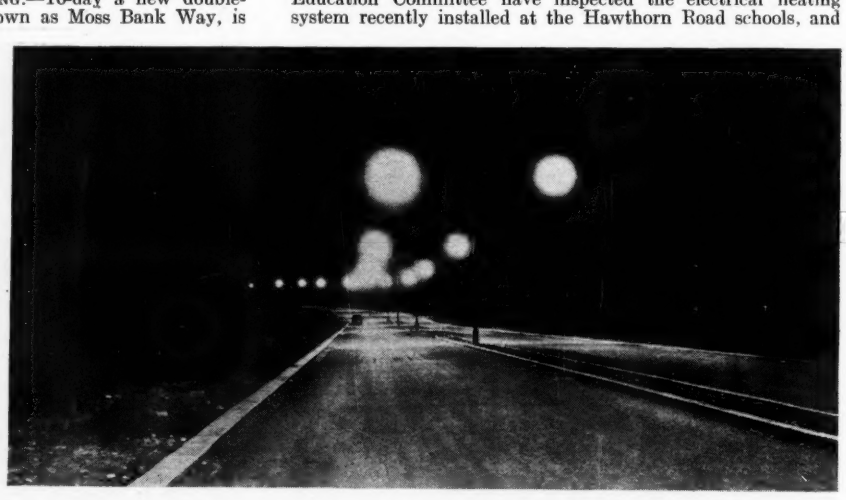
Bath.—ELECTRICITY CHOSEN.—Having considered gas and electrical schemes for the installation of cooking and water-heating apparatus in new dwellings on the north side of Dolemeads, the Housing Committee recommends the adoption of the electrical scheme at a cost of £502. A tender amounting to £1,468 for electrical installations in houses on the Englishcombe estate has been recommended for acceptance.

Bedford.—SUPPLY TO ESTATE.—The Electricity Committee is to extend the mains at a cost of £882 to provide a supply to seventy-six houses on the Honey Hills estate.

Birmingham.—EXTENSIONS AT HAMS HALL.—The four reinforced concrete cooling towers which are to be built as part of the extension scheme costing £5,000,000 at the Hams Hall power station will each be 317 ft. high—nearly twice the height of Nelson's Column—and 226 ft. in diameter at the base. The four towers will be capable of cooling an aggregate of 20 million gallons of water per hr. and will, it is believed, be the largest in the world. They are to serve a new power station building which has been designed in accordance with the recommendations of the Home Office for A.R.P. in electricity undertakings. The superstructure framework will be in reinforced concrete with concrete panelling of a minimum thickness of 13½ in. up to the height required for air-raid protection. No roof lights will be fitted and all windows will be above the top level of the machinery, thus reducing possible damage to plant from bomb splinters. Six separate switchhouses and a control room will be erected remote from the main station and, in addition, two new chimney stacks, each 400 ft. high, will be built. These will be of brick with a reinforced concrete framework for approximately 70 ft. from ground level. Preliminary work on this scheme has already begun and it is hoped to complete the first section of the station, comprising one turbo-alternator, three boilers, one cooling tower and supplementary plant, by the winter of 1946.

Blackburn.—LOAN.—Application is being made for sanction to borrow £20,000 to cover capital expenditure on the installation of consumers' apparatus under a new simple hire scheme.

Bolton.—ARTERIAL ROAD LIGHTING.—To-day a new double-track arterial road at Bolton, known as Moss Bank Way, is being officially opened. It is illuminated by Revo standards, brackets and fittings, and 150-W "Philora" sodium lamps. The accompanying photograph shows the excellent visibility which this equipment provides at night, in spite of the dark nature of the road surface. The fitting used is the Revo C.9684B, a simple cast-iron unit incorporating silvered mirror reflectors scientifically shaped and positioned to distribute the light evenly over the whole roadway, and to minimise glare. There are altogether 180 units, mounted 25 ft. high at 52-yd. intervals by means of double arm and single arm brackets. The road has two 20-ft. wide carriageways divided by a 4-ft. raised grass verge.



Moss Bank Way, a new arterial road at Bolton, lighted by sodium lamps in Revo fittings

Bradford.—RURAL APPLICATIONS FOR SUPPLY.—At a recent meeting of the Electricity Committee applications for an electricity supply to over 100 premises in the more sparsely populated districts of Thornton were granted, including thirty farms. The cost of affording the supplies is £7,411, and other extensions costing £5,380 were also agreed to.

Chingford.—SUB-STATION.—The North Metropolitan Electric Power Supply Co. is to erect a sub-station in Friday Hill.

Coventry.—SUB-STATION EQUIPMENT.—The Electricity Committee is seeking sanction to borrow £25,000 for sub-station equipment.

Darlington.—SPECIAL DISCOUNT.—A special discount of 10 per cent. is to be granted on all electricity accounts for the current quarter.

Dover.—SUPPLY TO FLOUR MILL.—In our last issue we recorded that the Town Council had authorised an extension of the supply to premises at Whitfield. At the same meeting plans were passed for an extension of the mains to the Charlton flour mill of G. W. Chitty & Co., at a cost of £1,470, the anticipated demand being 720,000 kWh per annum. Recently there have been applications to the Electricity Commissioners in respect of extensions and alterations to the value of £14,498.

Faringdon.—ELECTRICITY CHARGES.—The Council recently decided to request other local authorities in North Berkshire to join in asking the Wessex Electricity Co. for a reduction in charges. Mr. L. W. Knapp said that he did not live far from the centre of Shrivenham yet the company wanted £2[illegible] to lay on an electricity supply to his house. Mr. J. C. M. Moloney stated that the charge for electricity might be reasonable, but that for connecting up was excessive. Mr. T. R. Ken[illegible] said he had considered having electric light installed in his cowshed, which would have meant the erection of five poles but the company wanted a guarantee of £17 a year.

Frinton.—STREET LIGHTING.—The Frinton and Walton Urban District Council has approved in principle the adoption of a scheme for street lighting in Great Holland, and provision for this is to be made in next year's estimates.

Hawick.—CONSENT TO SALE OF UNDERTAKING WITHHELD.—The proposed sale of the local undertaking of the Urban Electric Supply Co., Ltd., to the Scottish Southern Electric Supply Co., Ltd., is subject to the consent of the Town Council, which holds compulsory purchase powers. At a special meeting last week the Council adopted the report of a special committee recommending the Council not to give its consent. According to a statement by the Town Clerk, the district manager of the Urban Co. had intimated that the undertaking was to be sold for £46,000 ordinary stock of the Scottish Power Co., and an amount in cash representing the value of capital and revenue, stores, and stock at July, 1938.

Heckmondwike.—WASHING MACHINES.—The Urban District Council is to introduce a scheme for selling domestic washing machines on deferred terms over a period of five years. The apparatus is to be let out at list prices plus 20 per cent., and initial payments are to be equal to approximately 10 per cent. of the total amount to be paid, the purchase to be completed in twenty quarterly payments.

Hornsey.—INCREASED LIGHTING RATE.—The lighting flat rate is to be raised from 2¾d. to 3d. per kWh, but the "all-in" tariff is not to be altered.

Keighley.—COOKERS ON HIRE.—The borough treasurer and the electrical engineer have reported on the question of the simple hire of electric cookers and it has been decided to hire out cookers at the following rentals:—Small size (cost, including wiring, not to exceed £8 10s.), £1 15s. per annum, and standard size (cost, including wiring, not to exceed £10), £2 per annum. The minimum term of hiring is to be five years.

Kettering.—ELECTRIC SCHOOL HEATING.—Members of the Education Committee have inspected the electrical heating system recently installed at the Hawthorn Road schools, and have found it to be quite satisfactory. It is considered to be economical, and will probably be adopted in other schools in the town.

Lancaster.—AIR RAID PRECAUTIONS.—Approval has been given to the estimate of the cost of implementing the recommendations contained in the A.R.P. report. Application is to be made to the Electricity Commissioners for sanction to the borrowing of the sum of £18,400 made up as follows: buildings, £1,500;

plant, £16,000; and mains, £900. Authority has been given to the engineer to place an order for the switchgear required.

London.—EXTENSIONS AT FULHAM GENERATING STATION.—Subject to the formal direction of the Central Electricity Board, Fulham Borough Council has agreed to extend its generating station at Townmead Road by the installation of three 270,000 lb. per hr. boilers, one 60,000-kW (m.c.r.) turbo-alternator, ancillary plant and the whole of the foundations, structural steelwork and part of the superstructure necessary to complete the station. The capital expenditure involved, including the cost of two other boilers already authorised, is made up as follows:—Buildings, £531,050; generating plant, £271,500; boiler plant, £840,500; coal and ash handling plant, £37,500; switchgear, £58,000; general electrical work, £83,000; other works £10,000, contingencies and engineering, £170,000; total £2,001,550. From this amount has to be deducted the cost, £600,000, of the two other boilers, making a net total for the extension of £1,401,550. The extension is required to be completed by the autumn of 1941 and will be put in hand immediately on receipt of the formal direction of the C.E.B. The work will be carried out by Mr. W. C. Parker, borough electrical engineer, who for the building and civil engineering will receive the collaboration of Messrs. S. H. White & Son.

J.E.A.'s PRICE INCREASES: APPEAL TO COMMISSIONERS.—A conference of local authorities in whose areas the London and Home Counties Joint Electricity Authority distributes electricity was held at Kingston on Tuesday last. A representative of the J.E.A. explained why it had been necessary to increase charges by 10 per cent., stating that the Electricity Commissioners insisted that the Authority should "balance its budget" and wipe out its deficiency by the end of 1943. The Authority could have reached this position by the end of 1946 without increasing its charges. A resolution was adopted that the Electricity Commissioners should again be approached to postpone the date of "equilibrium" until December, 1946.

Manchester.—INTERCONNECTION WITH SALFORD.—More of the proposed 33,000-V interconnecting cable between Manchester and Salford would be within the Salford area than on the Manchester side, but the Salford Corporation has asked that the cost of £10,000 should be shared equally as the cable is likely to be of equal value to the two authorities, and the Manchester Electricity Committee recommends that this request should be acceded to.

Marple.—OVERHEAD LINES INQUIRY.—A Ministry of Transport inquiry was held recently into an application by the Trent Valley Electricity Co. for consent to the erection of overhead lines at Strines, Stirrup Benches, Ludworth and Mellor (Gibb Lane) and also for consent to a number of lines already erected, with regard to which the inspector said that the Ministry strongly disapproved of the erection of lines without its consent and an assurance was given that the normal procedure would be followed in future. For the U.D.C. is was stated that the Council had its own electricity undertaking and had consistently used underground cables. It strongly objected to overhead lines because they interfered with the amenities of the district.

Milford Haven.—RURAL SUPPLIES.—Tentative discussions have been begun with the West Cambrian Power Co. with regard to powers of supply in rural districts beyond the Council's present electricity supply area.

Penistone.—STREET LIGHTING.—The Rural District Council has sealed an agreement with the Electrical Distribution of Yorkshire, Ltd., for street lighting at Cawthorne.

Peterborough.—STEPS TO ABATE GRIT EMISSION.—Complaints of the discharge of grit from chimneys at the power station have been receiving the consideration of the City Council, and the electrical engineer and manager is to obtain the views of the Central Electricity Board upon his suggestions for the abatement of the nuisance and submit a report.

NEW CABLE.—A larger cable is to be laid to supply the Dogsthorpe Grange estate at a cost of £470.

SODIUM LIGHTING.—When the scheme for the reconstruction of Dogsthorpe Road is begun, sodium lighting will be installed.

Raunds.—COUNCIL ESTATE SUPPLY.—With regard to the note under this heading in our last issue the Rushden and District Electric Supply Co., Ltd., informs us that Raunds is within its area, and not that of the Wellingborough Electric Supply Co., Ltd.

Rotherham.—POWER STATION EXTENSION.—The Town Clerk has received a direction from the Central Electricity Board to extend the Prince of Wales generating station at a total estimated cost of £377,500 by the installation of a turbo-alternator set with a maximum continuous rating of 25,000 kW, complete with the necessary ancillary plant, and two boiler units each having a maximum continuous evaporative capacity of 200,000 lb. of steam per hr.

Scunthorpe.—AIR RAID PROTECTION.—Materials costing £1,718 are to be purchased for carrying out the recommendations of the Electricity Commissioners regarding air raid precautions, subject to the purchase ranking for a grant.

Stoke-on-Trent.—SUPPLY EXTENSION.—A supply of electricity is to be given to 144 houses to be erected on a further section of the Meir Hillside estate at Longton at a cost of £1,150, and an additional supply is to be given to the Corporation housing estate at Meir at a cost of £1,250.

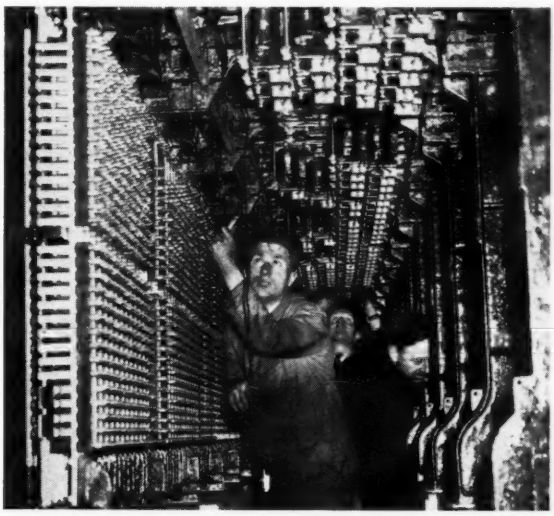
Sunderland.—ELECTRIC CREMATORIUM DECISION RESCINDED.—Some months ago the Council decided to install an electric furnace at the new crematorium, but the Ministry of Health intimated that it could not approve of this in view of the capital and running costs being much higher than for gas-fired equipment. The Council has therefore rescinded its previous resolution and has agreed to a gas installation.

Sutton Coldfield.—CHANGE-OVER.—The Electricity Committee is to change over the supply in the Four Oaks district at a cost of £2,278.

York.—FEEDER EXTENSIONS.—An expenditure of £52,133 on cables, switchgear and transformers is involved by a proposal to augment the trunk feeder system. A supply of electricity is also to be given to Upper and Lower Dunsforth and Branton Green at a cost of £945.

Traction

London.—NEW TRANSPORT BILL.—Application has been made by the London Passenger Transport Board for leave to introduce a Bill in the present session of Parliament which will, among other things, authorise it to operate new trolley-bus routes in Southwark, Camberwell and Kingston-upon-Thames.



Fifty men are working night and day building a temporary arrival signal box at Paddington (G.W.R.) Station to replace the one practically destroyed by fire. Last week the installation of the electrically operated frame of 141 levers was commenced. It is hoped to bring the signal box into operation by the middle of the month

Provision for turning trolley-buses includes a special application in respect of Victoria Embankment. Authority is also sought for the enlargement of the tunnels at a number of points on the Underground Railway system, and the construction of numerous short ventilating subways.

United States.—ELEVATED RAILWAY CLOSED.—Last Sunday saw the end of public transport on the sixty-year-old Sixth Avenue Elevated Railway, New York, which is to be demolished within 90 days. *The Times* states that the last train carried hundreds of passengers, who made the occasion a rowdy hunt for souvenirs.

Communications

China.—POWERFUL SHORT-WAVE TRANSMITTER.—A 35-kW short-wave radio station, under construction by the Marconi Company, is nearing completion at Chungking, the present headquarters of the Chinese National Government. Daily test transmissions are being made in both Chinese and English. —*Reuter.*

Denmark.—NEW COPENHAGEN BROADCASTING HOUSE.—The popularity of broadcasting in Denmark, as shown by a density of receiving sets of 214 per 1,000 of the population, reflects the first-class service given by Danish Broadcasting Authorities. To modernise the service still further a contract has been placed with Standard Electric A/S, Copenhagen, for the supply of complete studio equipment for a new Broadcasting House in Copenhagen. The new building will have some twenty studios, including a concert hall which, with a volume of 8,000 cu. m., will be one of the largest in the world, and will house an orchestra of 100 instrumentalists as well as a chorus of approximately 110 members. The programme amplifiers are to be of the latest type, including negative feedback circuits, and each amplifier will have its own mains power supply incorporated. There are to be three main control desks, a dramatic control desk and twelve "regie" or mixing desks of all-metal modern construction. The control equipment will utilise the new compact "Edgewise" type faders and the outgoing programme level will be observed on U.I.R. type programme meters. Each studio will be equipped with its own amplifiers and controlled, together with the echo rooms, mixer channels,

recording rooms, &c., from the main and dramatic control desks already mentioned. To set up a programme the appropriate mixing channel and studios will be selected by telephone type automatic dials installed on these desks. The operator will first dial the number of the mixer channel required, followed by the studio number. A call indicator in front of the operator will show the number of the selected studio as it is dialled, thus checking the correctness of his choice. The programme meter associated with the studio concerned will be automatically switched to an extension meter in front of the operator. When the automatic selection has been effected, a final special low-capacity relay will complete the connection to the outgoing programme line and release the switches. By this system the number of switches necessary is reduced to the minimum and the programme does not pass over the switch contacts. The equipment will be manufactured in the Copenhagen factory of Standard Electric A/S, with the exception of certain specialised units which will be furnished by Standard Telephones and Cables, Ltd., of London. The new equipment will be put into service in the spring of 1940.

Great Britain.—PROGRESS IN TELEPHONY.—In Green Paper 43 issued by the G.P.O. last week it is stated that fifteen years ago the international telephone system, so far as it affected this country, was limited to a service to Paris and the North of France, with a difficult and precarious service beyond, and a service to a few towns in Holland and Belgium. There were twenty lines to France, five to Belgium, and three to Holland. To-day the route mileage of international circuits which radiate from London is long enough to encircle the earth's equator three times. The wire mileage is 250,000, equal to the distance of the earth from the moon. London has become the main world switching centre for inter-continental calls. There are upwards of 100 trunk lines between London and Scotland, of which seventy-six have been provided since October, 1934. The total number of telephones in the world is approximately 35,000,000, of which 3,000,000 are in the British Isles.

NEW SUBMARINE CABLES.—New direct connections between London and Dublin and Liverpool and Dublin are provided as a result of the recent bringing into service of two additional submarine telephone cables laid between Nevin, North Wales, and Howth Head, Dublin Bay.

MOBILE TELEPHONE EXCHANGE.—On Wednesday what is said to be the first mobile telephone exchange in the world was inaugurated at the General Post Office. It is to take the place of a small manual exchange at North Weald, Essex.

RADIO-TELEPHONY.—Preparations are now nearly complete for a radio-telephone service between the Outer Hebrides and the mainland through a new radio station at Barra, near Castlebay, and a station at Glengorm, Isle of Mull. Another station at Point, Isle of Mull, is expected to be finished next year.

Norway.—RADIO AND FISHING FLEET.—The importance of radio equipment is being realised to a growing extent. At the moment fifty-five vessels of the Aalesund fishing fleet carry full radio equipment. In view of the usefulness of radio communication, the Norwegian fishery organisations are appealing to the Government for the abolition of import tariffs on foreign equipment for small-craft radio installations. The Government is, moreover, requested to spend 150,000 kroner on improving the present coastal transmitter at Aalesund.

Sweden.—POLICE RADIO.—Göteborg, the first Swedish city to adopt police radio, has now ten cars, of which six are in commission day and night. The capital, Stockholm, is increasing its fleet of cars equipped with radio apparatus, and police radio is shortly to be introduced at Malmo and Norrkoping.

INCREASE IN RADIO LICENCES.—There was an increase of nearly 80,000 in the number of radio licences in force last year and it is estimated that the number can now hardly rise by more than 70,000 so that the saturation point will be reached in the near future.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Taylor Tunnicliff (Electrical Industries), Ltd.—Public company. Registered November 30th. Nominal capital, £500,000. Objects: To acquire and hold shares or stock, debentures, debenture stock, bonds, obligations or any other securities; and to carry on the business of mechanical, electrical and general engineers, manufacturers, producers, contractors, erectors, dealers, maintainers and repairers of plant, machinery, engines and apparatus for all purposes; potters and manufacturers of and dealers in china, porcelain, stoneware, earthenware, &c.; and to adopt an agreement with the Standard Industrial Trust, Ltd. The directors are: W. J. Kent, Hough Wall, Crewe, Ches, P. Cooper, Blurton Priory, Stoke-on-Trent, and A. E. Wilbraham, The Hawthorns, Keele, Stoke-on-Trent (all directors of Taylor Tunnicliff & Co., Ltd.). Solicitors (Herbert Smith & Co., 62, London Wall, E.C.2.

Avery Ward & Co., Ltd.—Private company. Registered November 30th. Capital, £3,000. Objects: To carry on the business of designers, manufacturers and repairers of and dealers in electrical and artificial lighting apparatus, fittings and accessories of all kinds, &c. The directors are: P. A. Ward (permanent managing director) and B. M. Ward, both of 87, Elwill Way, Beckenham, Kent.

Electrogoods (Midland), Ltd.—Private company. Registered November 25th. Capital, £1,000. Objects: To carry on the business of manufacturers of electrical household appliances and requisites, electrical and mechanical motors and accessories, electrical and general engineers and contractors, manufacturers of and dealers in wireless sets; manufacturers, producers, distributors and exhibitors of films, &c. The subscribers are: G. W. Disturnal, 87, Edward Street, West Bromwich, and C. Woodall, 13a, Sandon Road, Edgbaston, Birmingham. The first directors are G. W. Disturnal and two others to be appointed by the subscribers.

Radtricity, Ltd.—Private company. Registered November 30th. Capital, £5,000. Objects: To carry on the business of electricians, radio and mechanical engineers, &c. The subscribers are: Miss M. E. Bowtte, 207, Earls Path, Loughton, Essex, and Miss F. M. Nechamkin, 21, Grazebrook Road, Stoke Newington, N.16. Solicitor: Lucien Fior, 2, Bloomsbury Street, W.C.1.

Fumiphone, Ltd.—Private company. Registered December 2nd. Capital, £500. Objects: To acquire from L. F. Richardson and V. J. Faulkner an exclusive licence to use, manufacture and vend under British Patent No. 12146/38 a sanitary or hygienic device for telephone instruments of the hand-microphone class; and to carry on the business of manufacturers of and dealers in apparatus for the cleansing, fumigation, deodorisation and sterilisation of telephone and other equipment, fumigants, chemicals, disinfectants, &c. The directors are: L. F. Richardson, 10, Jersey Avenue, Stanmore, Middlesex, V. J. Faulkner, 40, Princes Drive, Harrow, and H. A. Crabtree, 6, "Eversley," Westwood Park, Forest Hill, S.E.23. Registered office: 1, New Court, Lincoln's Inn, W.C.2.

G. A. Brittain (Radio), Ltd.—Private company. Registered December 3rd. Capital, £10,000. Objects: To acquire the business of radio dealers carried on by G. A. Brittain (Radio), Ltd. (incorporated in Eire). The permanent directors are: G. A. Brittain (managing director and chairman), and Mrs. A. L. Brittain, 10, Dyke Close, Hove, 4, and G. C. V. Brittain, address not stated. Solicitors: Cardens, Brighton.

E. G. Wood, Ltd.—Private company. Registered December 3rd. Capital, £1,640. Objects: To carry on the business of manufacturers, suppliers and distributors of and wholesale or retail dealers in radio receiving and transmitting sets and apparatus, &c. The directors are: A. A. Chown, 1, The Green, Ewell, Surrey, and H. E. Skan, "Littlecote," 3, Huntercombe Lane North, Maidenhead. Registered office: 2, Copthall Court, E.C.2.

Emulsifying Processes, Ltd.—Private company. Registered December 2nd. Capital, £3,000. Objects: To acquire the business of a refrigerating engineer and consultant and accredited agent carried on by Wm. J. A. Frey, at 20-21, Tooks Court, Cursitor Street, E.C., as the Commercial Equipment & Maintenance Co. The permanent directors are: W. J. A. Frey (chairman and managing director), and Mrs. A. M. Frey, both of 45, Croxted Road, W. Dulwich, S.E.21. Registered office: 20-21, Took's Court, Cursitor Street, E.C.4.

McAllisters, Ltd.—Private company. Registered in Dublin December 1st. Capital, £5,000. Objects: To carry on the business of manufacturers of and dealers in wireless telegraphy, public address, telephone, television, optical and photographic apparatus, &c. The subscribers are: K. McAllister and G. McAllister; both of Duke Street, Drogheda, Co. Louth. Secretary: J. L. Kealy, of 8, Laurence Street, Drogheda.

Charles Hunt & Co., Ltd.—Private company. Registered December 3rd. Capital, £600. Objects: To carry on the business of mechanical and electrical engineers, electroplaters, nickel and chromium platers, &c. The subscribers are: C. Hunt and Mrs. C. Hunt, both of Park View, Park Road, Egham, Surrey. Solicitors: R. Shapiro & Co., 68, Finsbury Pavement, E.C.2.

J. Scarborough, Ltd.—Private company. Registered November 25th. Capital, £1,000. Objects: To carry on the business of wholesale and retail dealers in radio television and electrical apparatus and appliances, &c. The directors are: J. C. Scarborough, 37, Marlborough Avenue, Hull; and F. Davies, 27, Sutton Road, Hull. Registered office: Paragon House, Paragon Street, Hull.

Premier Accumulator Co., Ltd.—Private company. Registered November 25th. Capital, £100. Objects: To carry on the business of makers of and dealers in electrical or chemical appliances and goods, manufacturers of and dealers in accumulators, dynamos, &c. The directors are: A. W. Woodward, Seven Elms, Ardleigh Green Road, Hornchurch; and C. H. Branton, 37, Briar Avenue, Norbury, S.W.16. Registered office: Dagenham Dock, Essex.

Celtis (Electrical), Ltd.—Private company. Registered November 26th. Capital, £5,000. Objects: To carry on the business of manufacturers of and dealers in electrical and mechanical apparatus of all kinds, accumulators, batteries, wireless sets, &c. The permanent directors are: N. E. Butcher, 36, Bridge Road East, Welwyn Garden City, Herts; and F. W. Astbury, 14, St. Peter's Square, Manchester. Solicitors: Langlois & Co., 170, Bishopsgate, E.C.2.

Allan and Hunt, Ltd.—Private company. Registered November 25th. Capital, £500. Objects: To carry on the business of electrical, mechanical and general engineers and contractors, electrical wiring and lighting experts, manufacturers of and

dealers in electrical plant, stoves, cookers, &c. The directors are: A. P. Hunt and Mrs. E. D. Hunt, both of 13, Southend Road, Beckenham. Registered office: 7, Newport House, Great Newport Street, W.C.2.

A.E.R. (1938), Ltd.—Private company. Registered November 26th. Capital, £100. Objects: To carry on the business of electrical engineers, &c. The subscribers are: H. E. Tregunna, 61, Wentworth Park, N.3; and F. J. Hunt, 5, Mildenhall Road, E.5. F. J. Hunt is the first director.

Simpsons Radio & Electrical Engineers, Ltd.—Private company. Registered November 24th. Capital, £100. Objects: To carry on the business of smallware factors and manufacturers, dealers in wireless apparatus and household utility articles, electrical contractors, electricians, electrical engineers, &c. The directors are: K. W. Simpson, "Nessciffe," Hall Street, Wolverhampton, and two others. Registered office: Radio Stores, 400, Dudley Road, Wolverhampton.

Electronic Rangefinders, Ltd.—Private company. Registered November 22nd. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in scientific instruments and apparatus and electrical and mechanical instruments, machines and devices of all kinds, &c. The subscribers are: T. H. Lancaster and W. O. Cave, both of 115, Leadenhall Street, E.C.3. Registered office: 5, Buckingham Place, S.W.1.

Multiple Products, Ltd.—Private company. Registered December 1st. Capital, £100. Objects: To carry on the business of electrical equipment specialists, &c. The subscribers are: G. E. St. J. Jackson, Dulce Domum, Baring Road, Beaconsfield, Bucks; and P. P. Sargant, C.A., 56, Ludgate Hill, E.C.4. Secretary: G. Jackson.

Returns of Electrical Companies

Statements of Capital

Alliance Electrical Co., Ltd.—Capital, £10,000 in £1 shares. Return dated April 27th (filed September 8th), 1938. 3,854 shares taken up. £1,927 (10s. per share) paid. £1,927 (10s. per share) considered as paid. Mortgages and charges, nil.

F. W. Lechner & Co., Ltd.—Capital, £750 in £1 shares. Return dated June 30th, 1938. 400 shares taken up. £400 paid. Mortgages and charges at date of return, nil. Since registered: Debenture dated October 12th, 1938, to secure £250. A return of allotments made up to October 12th, 1938, shows a further five ordinary shares allotted for cash and fully called up.

Kalee, Ltd.—Capital, £79,246 in 7,500 "A" preference, 61,250 "B" preference and 10,496 ordinary shares of £1. Return dated August 10th, 1938. 6,215 "A," 61,250 "B" and 10,496 ordinary shares taken up. £20,695 paid. £57,266 considered as paid. Mortgages and charges, nil.

Bogota Telephone Co., Ltd.—Capital, £300,000 in £1 shares. Return dated November 29th, 1937. 258,493 shares taken up. £245,993 paid. £12,500 considered as paid. Mortgages and charges, nil.

Automatic Electrical Refrigerators, Ltd.—Capital, £5,000 in 4,985 preference shares of £1 and 300 founders' shares of 1s. Return dated August 22nd, 1938 (filed September 29th, 1938). 4,000 preference and 300 founders' shares taken up. £4,015 paid. Mortgages and charges, nil.

Southern Brazil Electric Co., Ltd.—Capital, £507,300 in 182,800 preference shares of £1 and 650,000 ordinary shares of 10s. Return dated September 7th, 1938. All shares taken up. £3 10s. paid on 7 ordinary shares. £507,796 10s. considered as paid on 182,800 preference and 649,993 ordinary shares. Mortgages and charges, £756,415.

Vincent Switchgear Manufacturing Co., Ltd.—Capital, £10,000 in 10,000 shares of £1 each. Return dated September 14th, 1938. 7,948 shares taken up. £7,948 considered as paid. Mortgages and charges, £3,000.

Homelectric, Ltd.—Capital, £100 in £1 shares. Return dated August 1st, 1938. All shares taken up. £100 paid. Mortgages and charges, nil.

Avenue Electric Co., Ltd.—Capital, £100 in £1 shares. Return dated September 20th, 1938. 100 shares taken up. £100 paid. Mortgages and charges, nil.

Allen & Welsby, Ltd.—Capital, £1,500 in £1 shares. Return dated September 25th, 1938. 1,060 shares taken up. £1,060 paid. Mortgages and charges, nil.

Ralph Garrett, Ltd.—Capital, £1,000 in £1 shares. Return dated September 12th, 1938. 802 shares taken up. £802 paid. Mortgages and charges, £1,500.

Bustler Electric Co. (London), Ltd.—Capital, £2,000 in £1 shares. Return dated August 21st, 1937. 1,250 shares taken up. £1,200 paid, £50 considered as paid. Mortgages and charges: £800.

Genristo, Ltd.—Capital, £3,000 in 3,000 preference and 5,000 ordinary shares of £1. Return dated October 27th, 1938. 2,789 preference and 3,452 ordinary shares taken up. £6,239 paid. £2 calls unpaid. Mortgages and charges, nil.

Auto Service Electrical Co. (Falmouth), Ltd.—Capital, £3,000 in £1 shares. Return dated September 22nd, 1937. All shares taken up. £1,620 paid, £1,380 considered as paid. Mortgages and charges nil.

Mortgages and Charges

North Metropolitan Power Station Co., Ltd.—Particulars have been filed of 3½ per cent. second mortgage debenture stock, Series "B" 1965, to secure £1,000,000, authorised November 11th, 1938, and covered by trust deed of same date, charged on freehold lands and buildings and fixed plant and machinery theron at Brimsdown, Enfield, Mdx., interest in agreements and leases and the rentals and other moneys payable thereunder, and the company's undertaking and other property, present and future, including uncalled capital. The whole amount is now issued. Trustees: Baring Bros. & Co., Ltd. (The stock ranks *pari passu* with £850,000 5 per cent. second mortgage debenture stock, 1963, secured by trust deed dated August 19th, 1930, and £1,000,000 3½ per cent. second mortgage debenture stock, 1963, secured by trust deed dated February 16th, 1937.) The whole of this issue of second mortgage debenture stock has been sold at 96 per cent.

Kepston, Ltd.—Letter of deposit dated November 2nd, 1938, to secure all moneys due or to become due from the company to the Westminster Bank, Ltd., charged on 148, High Street, and property in Water Lane, Berkhamsted.

Dicks, Ltd.—Three mortgages on properties in Winchester, all dated November 1st, 1938, to secure all moneys due or to become due from the company to the National Provincial Bank, Ltd.

Utilities (London), Ltd.—Particulars filed of £3,000 debentures, authorised November 24th, 1938, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

J. J. Eastick & Sons, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated November 3rd, 1938, to secure all moneys not exceeding at any time £10,000. Holder: W. A. C. Henderson, 23, Chatterton Road, Finsbury Park, N.

Ismay Cables, Ltd.—Mortgage and charge on Wantz House and Wantz Cottage, Dagenham, and the company's undertaking and other property, including uncalled capital (subject to charge dated August 15th, 1938), dated November 18th, 1938, to secure £15,000 and all other sums due or to become due from the company to M. Samuel & Co., Ltd., 55, Bishopsgate, E.C.2.

Adelaide Electric Supply Co., Ltd.—Issue on November 14th, 1938, of £250,000 5½ per cent. "H." consolidated debenture stock (Australian stock). Part of a series already registered.

Attenborough & Turpin, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated November 18th, 1938, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

J. & S. Farr, Ltd.—Satisfaction to the extent of £3,000 (amount owing on November 1st, 1929), on March 20th, 1937, of mortgage dated September 30th, 1913, and registered July 1st, 1933. Notice filed November 25th, 1938.

Increases of Capital

Belliss & Morcom, Ltd.—The nominal capital has been increased by the addition of £450,000 in £1 ordinary shares, beyond the registered capital of £300,000. The 15,000 ordinary shares of £10 in the original capital have been sub-divided into 150,000 ordinary shares of £1.

Austin Walters & Son, Ltd.—The nominal capital has been increased by the addition of £7,000, beyond the registered capital of £3,000. The additional capital is divided into 7,000 ordinary shares of £1.

Tamworth District Electric Supply Co., Ltd.—The nominal capital has been increased by the addition of £50,000 in £1 ordinary shares, beyond the registered capital of £200,000.

Electrical Finance and Securities Co., Ltd.—The nominal capital has been increased by the addition of £25,000 in £1 ordinary shares beyond the registered capital of £500,000.

Reports and Dividends

Enfield Rolling Mills, Ltd., held its annual meeting on December 2nd when the Earl of Verulam (chairman), who presided, said that the progress made last year had been maintained and improved upon. The result shown was due to an all-round increase in efficiency at the factory. In general, the price of metals and the volume of business rose and fell in sympathy. At the end of September, 1937, they had just been through a period of rising prices. In October of that year a fall had set in and had continued until May, since when there had been a recovery. In the refinery they had been busy throughout the year. The rod rolling mill, which had been closed down in September, 1937, had started again at the date of the last meeting. They had made some substantial alterations designed to increase the output of copper rods per shift. The copper sheet mill had worked much more satisfactorily. Costs had been brought down, and they had been able to select a more profitable type of order than formerly. In the zinc mill the rolling of ordinary sheets had been satisfactory, and the staff had now reached the degree of skill which was required for the production of first-class engraving plates. They had decided that the refinery should be enlarged, and a scheme had been worked out and adopted by the board under which the capacity of the refinery would be increased by 60 per cent. and moreover the cost of refining should be reduced. A total outlay had been estimated of about £70,000 on plant and buildings and about £80,000 on further stocks of copper. With the help of Enfield Cable Works, Ltd., they had arranged to borrow the money temporarily at a cheap rate. They considered that they were thereby consolidating the importance of the company in the base metal industry and also, by cheapening their cost of refining copper, putting themselves in a better position to face any competition that might arise.

Taylor Tunnicliff (Electrical Industries), Ltd.—Particulars were published on Tuesday last of an offer for sale of 200,000 5½ per cent. cumulative preference shares of £1 each at 21s. per share. The company, whose registration is recorded on the preceding page, is acquiring the share capitals of a group of companies engaged in the manufacture of electrical insulators, refractories, and kindred products. The authorised and issued capital of the new undertaking will be £500,000 in £200,000 of 5½ per cent. cumulative preference shares of £1 each, and £300,000 of ordinary 5s. shares. All the ordinary shares are being issued in part satisfaction of the purchase consideration payable to the respective vendors. The companies whose issued share capital is being acquired are Taylor, Tunnicliff & Co., Ltd., originally founded in 1867; Electric Transmission, Ltd., formed in 1926; Taylor, Tunni

cliff (Refractories), Ltd., incorporated in August, 1926; and Electric & Ordnance Accessories, Co., Ltd., formed in 1928.

The British Power & Light Corporation, Ltd.—The list opened and closed on Friday last for an issue of 600,000 4½ per cent. cumulative preference shares of £1 each at 21s. The new shares will rank *pari passu* with £1,000,000 of 6 per cent. preference shares already in issue as regards both capital and dividend, but in the event of a capital repayment will have the right additionally to a premium of 1s. per share. They participate also in voting rights. The new capital is required to provide funds for repayment of bank loans and for further development. The Corporation is a holding company, deriving practically all its income from the North Wales Power Co. and various distributing companies.

The Brush Electrical Engineering Co., Ltd., proposes to raise its authorised capital from £600,000 to £1,000,000. This will be effected partly by creating 200,000 £1 5½ per cent. preference and 65,000 £1 ordinary shares, which are required for the purpose of acquiring the engine-making section of the business of Petters, Ltd. The company will also create 25,000 £1 ordinary and 110,000 £1 unclassified shares. A meeting to consider the proposals will be held on December 20th.

British Industrial Plastics, Ltd., reports a net profit for the year ended September 30th of £22,184, as compared with £31,098 in the preceding year. The ordinary dividend for the year is 6 per cent. (against 8 per cent.), and £5,697 is carried forward (against £4,173 brought in).

The Singapore Traction Co., Ltd., has decided to defer any dividend on the ordinary stock until the accounts for the year are available, but the directors are of opinion that the accounts will justify the payment of a reasonable dividend. In making the announcement the directors refer to the strike which caused a suspension of the trolley-bus and omnibus services from July 7th to August 21st, and point out that it has necessarily affected the company's revenue adversely.

The East India Tramways Co. proposes to pay a final dividend of 5 per cent., tax free (against 6 per cent.), making 9 per cent. for the year. As the interim payment of 4 per cent. in the previous year was distributed on the smaller capital prior to the 33⅓ per cent. scrip bonus in July, 1937, the total distribution for 1937-38 is equal to that of the previous year.

R. A. Lister & Co., Ltd., are paying a final dividend of 5 per cent., less tax, making 10 per cent. for the year (same), and a cash bonus of 7½ per cent. (against 6 per cent.).

The Globe Telegraph & Trust is maintaining its quarterly interim dividend at 1¼ per cent., tax free.

Hick, Hargreaves & Co. are again paying an interim dividend of 2 per cent., less tax.

The Revo Electric Co., Ltd., has announced an interim dividend of 5 per cent., less tax. A similar interim was paid last year but was distributed on smaller capital.

Stocks and Shares

TUESDAY EVENING.

IT cannot be said that the year is closing in a manner that brings satisfaction to holders of Stock Exchange securities. Diplomatic relations between Italy and France have been disturbed by unexpected developments which, in their turn, led to a certain amount of selling and a re-emphasis of the feeling of caution, the effect of which is to keep capital as liquid as possible, instead of its being employed in stocks and shares.

The peace-mission of Herr von Ribbentrop to Paris had an effect upon Stock Exchange prices more favourable in New York than in London. New issues attract a fair amount of attention; but, as in the case of the British Power and Light offer of preference shares, prices show a disposition to recede even where shares are oversubscribed.

The unemployment figures give little encouragement, but the Board of Trade returns recently published show that retail trade in the provinces is decidedly good, this being in contrast to a falling off in London's retail business.

The death of Sir Thomas Callender removes a figure which was well known in the City, and for whose opinions great respect was felt.

Cable and Wireless Development

News of the Cable and Wireless plan to create a system of wireless communication throughout the Empire produced no show of enthusiasm in the market for the stocks concerned. In effect, the preference stock has weakened further to 81, and the ordinary at 38 remains near the year's lowest point. Involved in the scheme is the equipment with wireless of each of the cable stations where no such service is at present in operation. From the strategic point of view, the value of such a system is generally recognised. At the same time, stockholders may be wondering doubtfully about the commercial possibilities. Expenditure on the installations and experiments will be provided by the company. Whether the money will earn a fair return can only be decided by events. While still lacking any sort of evidence that this year's cut in cable rates was a profitable step, the market can be excused the lack of response to this latest development. By common consent, the rapid expansion of cheap air mail services is probably proving a formidable competitor to the other means of communication.

Borrowing versus Taxation

Both the gilt-edged and the industrial markets sat up and took the greatest interest in Sir John Simon's reference in Parliament to defence expenditure. Uncertainty on this question of whether borrowing or taxation is to play the major part in footing the rearmament bill is not the least of the restraints on market activity. In reality, of course, the plain statement that the Government proposed to apply for larger borrowing powers did not give very much away. Those who read into it a hint of no fresh taxation evidently took too much for granted. More general acceptance is given to the assumption that taxation will be kept as light as possible, leaving loans to bear the brunt of the burden. This it seems would be the popular course, particularly, it goes without saying, so far as the industrial markets are concerned. For gilt-edged, neither course could be anything but unpalatable: on balance, opinion regards borrowing as the lesser of the evils.

Equipment and Manufacturing

On the average, prices in the industrial markets have weathered another difficult week without giving ground to any serious extent. Shares connected in one way or another with armament work continue to claim the larger proportion of such business as is passing. This connection is evidently responsible in part for the continued firmness in Associated Electrical Industries at 39s. The group is known to be co-operating actively in the Air Force expansion. English Electrics at 3[illegible]s. are also attracting a fair amount of attention, partly for the same reason and partly on dividend expectations. Some people anticipate that the dividend will be raised next February from 10 per cent. to 12½ per cent.; the optimists are going for 15 per cent. Other points of note in the electrical equipment market are the recovery of 1s., to 25s. 9d., in Walsall Conduits, and the dullness of Callenders, at £4. Crompton Parkinsons at 25s. are quoted ex-dividend, but still cum the 50 per cent. share bonus. Allen Wests have risen to 6s. 6d., the highest price this year.

British Power & Lighting Preference

The character and terms of the British Power and Light Corporation's issue of 600,000 4½ per cent. cumulative preference shares, at 21s., accorded well with the present mood of investment. A yield of 4¼ per cent. is deemed a satisfactory return from preference shares in the electricity supply market, and the price of the offer left no room for the misgivings sometimes associated with preference shares which do not stand within easy distance of par. Being redeemable at 21s. in a liquidation the shares are well removed from doubts in that connection. The company's subsidiaries, of which the more important operate in North Wales, have been steadily augmenting the parent concern's revenues for a number of years. On the last-published figures, profits are at present covering about two and a half times the amount which will be required to pay dividends on the new issue, and on the existing 6 per cent. preference with which the 4½ per cents. will rank equally. It is thought that the new money will be put to uses profitable enough to widen the cover later on. Dealings in the shares began this week at 4½d. premium, but the price subsequently receded to a small discount.

Other Preference Shares

Except where a high premium in the price of the shares acts as a deterrent, the 4½ per cent. yield on the new British Power and Light preference compares favourably with others of the kind. Only about 3¾ per cent. can be obtained from the soundest. This is the return, for instance, on Scottish Power 4 per cent. preference, which are on offer at present at 21s. 6d. County of London fours, at 21s. 3d., pay about the same, while on Midland Counties 4½ per cents., at 23s., the return is even lower. For yields of 4 per cent. upwards, it is generally necessary to pay the unpopular high premium. Scottish Power 6 per cents., for instance, which cost 29s. 6d., give a return 5s. per cent. higher than that on the fours, with which they rank equally. The 6 per cent. issues of Yorkshire Electric, North Metropolitan and County of London can all be bought in the neighbourhood of 30s., to yield 4 per cent. On most of the 7 per cent. preference issues, the return is a shilling or two better. North-Eastern Electric sevens are offered at 34s., yielding £4 2s. 4d. per cent. An interesting offer for sale this week was that of 200,000 5½ per cent. £1 preference shares in Taylor Tunnicliff (Electrical Industries), Ltd. The subscription price was a guinea. Lists opened and closed on Wednesday.

Miscellaneous Matters

Pending developments, London Transport "C"—perhaps the most discussed stock of the moment—has shed a point, to 77½. No fresh element in the situation has come to light since the news that a representative organisation of stockholders is in the process of being formed. Controversy continues unabated on the questions of an application for receivership; of increases in the bus and train fares; and of a change in the stock's status, suggested by the chairman of T. Tillings, whereby the dividend rate would become a fixed 4 per cent. guaranteed by the Government. The Home Railway market also awaits developments to accrue from the meetings between the Minister of Transport and the heads of the main lines. A state of suspended animation prevails in the interim. Prices of electricity supply shares remain practically unchanged, interest being occupied mainly with the proposal that Parliament should take steps to remove some of the industry's uncertainties during the long wait for legislation. Dullness in the gilt-edged market is explained by the repatriation of French funds, following M. Daladier's successes.

Electrical Companies' Shares

Prices, dividends and yields

Company.	1938. High-est.	1938. Low-est.	Dividend. Pre-vious.	Dividend. Last.	Price Dec. 6.	Rise or Fall.	Yield p.c. £ s. d.
Home Electricity Companies.							
Bournemouth and Poole ...	68/3	62/–	15	15	68/3	+9d.	4 8 0
British Power & Light ...	30/9	24/6	6	7	28/–	–6d.	4 18 3
City of London	34/6	28/6	7½	7½	32/–	—	4 13 9
Clyde Valley	42/6	33/–	8	8	36/3	—	4 8 2
County of London... ...	51/9	38/9	10½	10½	46/–	–1/–	4 11 5
Edmundson's :							
7% Pref....	33/3	30/–	7	7	31/3	—	4 9 6
Ord.	40/9	18/9	9	9	26/–xd.	+6d.	—
Elec. Dis. Yorkshire ...	43/6	37/9	9	9	41/3	—	4 7 5
Elec. Fin. and Securities...	51/9	49/–	12½	12½	47/6xd.	—	5 5 3
Elec. Supply Corporation...	55/–	50/–	12	12	52/6	—	4 11 5
Isle of Thanet	21/3	18/6	4	4	20/–	—	4 0 0
Lancs Light and Power ...	35/–	26/–	7½	7½	31/3	—	4 16 0
Llanelly Elec.	23/6	21/–	5½	5½	21/6	—	5 2 4
Lond. Assoc. Electric ...	32/9	28/–	7	7	30/9	—	4 11 4
London Electric	36/3	32/–	8	10	34/–	—	4 2 4
London Power Deb. Red.	108¾	100	5	5	106	—	4 14 6
Metropolitan	51/–	41/–	10	12	48/3	—	4 19 7
Midland Counties	39/9	33/–	8	8	36/3	—	4 4 3
Mid. Elec. Power	41/9	37/–	8	9	40/–	—	4 10 0
Newcastle Elec.	31/9	27/6	7	7	28/9	—	4 17 4
North Eastern Electric :							
Ordinary...	34/–	25/–	7	7	31/–	—	4 10 6
7% Pref....	34/–	30/–	7	7	32/6	—	4 6 2
Northampton	47/6	43/9	10	10	46/3	—	4 6 7
Notting Hill 6% Pref. (£10)	14½	13½	6	6	13½	–½	4 12 4
North Met. Elec. :							
Ordinary...	49/–	43/–	10	10	46/3	—	4 6 7
6% Pref....	30/6	28/3	6	6	29/6	—	4 1 4
Richmond Elec.	30/6	28/–	7	7	28/9	—	4 17 5
Scottish Power	38/9	32/–	8	8	35/9	—	4 9 6
Southern Areas	22/9	18/6	4½	5	21/3	—	4 14 1
South London	32/6	31/–	7	7	31/6	—	4 9 0
West Devon	23/3	21/3	5	5	1½	—	4 9 0
West Glos.	19/–	16/9	2	2	19/–	—	2 2 1
Yorkshire Elec.	42/–	36/9	8	8	39/6	–6d.	4 1 0
Overseas Electricity Companies.							
Atlas Elec.	4/6	2/6	Nil	Nil	2/9	–3d.	—
Calcutta Elec.	44/3	36/3	12*	10*	2	—	5 0 0
Cawnpore Elec.	40/–	35/–	10	10	36/3	—	5 10 6
East African Power ...	28/3	22/6	7	7	23/6xd.	+6d.	5 19 2
Jerusalem Elec.	26/9	23/3	5	6	24/–	—	5 0 0
Kalgoorlie (10/–)	12/–	9/6	7½	7½	10/3	—	7 6 4
Madras	34/6	28/9	8*	8*	30/–	—	5 6 8
Montreal Power	31½	26½	1½	1½	32½	—	—
Palestine Elec. "A" ...	31/9	27/–	7½*	7½*	30/–	—	5 0 0
Perak Hydro-electric ...	25/3	17/–	7	6	18/9	—	6 8 1
Shawinigan Power ...	23½	16½	65cts.	85cts.	22	—	—
Tokyo Elec. 6%	65½	39	6	6	57½	—	10 8 8
Victoria Falls Power ...	76/3	55/–	12	13½	70/–	—	3 17 2
Whitehall Investments Pref.	22/3	15/–	7½	7½	17/6	—	8 11 6
Public Boards.							
Central Electricity :							
1950–70	115¾	97	5	5	110½	—	4 10 6
1955–75	118½	100	5	5	113½	—	4 8 1
1951–73	111	95	4½	4½	107	–1½	4 3 9
1963–93	101	85	3½	3½	95½	—	3 13 4
London Elec. Trans. Gtd.	93½	88	2½	2½	90½	—	2 15 3
London & Home Counties,							
1955–75	112¾	97½	4½	4½	110	—	4 1 10
Lond. Passenger Transport :							
A	119½	104¾	4½	4½	109½	—	4 2 2
B	122¾	105	5	5	114½	+1	4 7 4
C	84	68	4½	4	77½	–1	5 3 3
West Midlands Joint Elec.,							
1948–68	115½	102½	5	5	113	—	4 8 6
Telegraph and Telephone.							
American Tel. & Tel. ...	154½	114	9	9	158½	—	5 13 7
Anglo-Am. Tel. :							
Pref.	115½	100½	6	6	100½	—	5 19 5
Def.	28	23	1½	1½	23	—	6 10 5
Anglo-Portuguese	23/6	19/3	8	8	21/3	—	7 10 7
Cable & Wireless :							
5½% Pref.	104	81	4½	5½	81	–2	6 15 10
Ord.	67¾	36	—	4	38	—	10 8 0
Income	102½	99	—	—	99½xd.	–1	4 0 5
Canadian Marconi $1 ...	6/6	3/9	—	Nil	5/–	—	—
Globe Tel. & Tel. :							
Ord.	32/6	27/6	5½*	7½*	27/6xd.	—	5 9 1
Pref.	27/6	23/9	6	6	26/3xd.	+6d.	4 11 5
Great Northern Tel. (£10)...	42½	34	20	20	37½	–1½	5 6 8
Marconi-Marine	30/6	21/6	10	7½	23/9	—	6 6 4
Oriental Telephone Ord. ...	59/3	2½	12*	12*	2½	—	4 11 3
Radio Corpn.	9½	4½	8	6	8	–½	—
Telephone Props	13/9	11/3	5	6	12/6	–9d.	9 12 0
Telephone Rentals (5/–) ...	10/–	7/6	5	6	9/3	—	3 4 10
Western Union	34½	17	2½	—	26½	—	—
Traction and Transport.							
Anglo-Arg. Trams :							
First Pref.	11/–	2/6	Nil	Nil	3/9	–1/8	—
4% Inc.	31	8	Nil	Nil	9	—	—
British Electric Traction :							
Def. Ord.	1060	675	5	5	900	–25	—
Pref. Ord.	175	150	8	8	165	—	4 17 0
Bristol Trams	45/–	34/3	5	8	2	—	4 0 0
Brazil Traction	14½	7½	70cts.	$1	10½	–1	—
Calcutta Trams	26/9	21/6	8	8	24/6	+6d.	6 10 8
Cape Elec. Trams	18/6	15/6	5	6	17/6	—	6 17 2
Lancs Transport	35/3	29/3	10	10	36/3	+1/8	5 10 3
Mexican Light :							
1st Bonds	30	16½	5	5	25	—	—
Rio 5% Bonds	91	47	5	5	60	—	8 6 8
Southern Rly :							
5% Prefd.	87	48	5	—	57½	—	—
5% Pref....	116	83	5	5	91½	–1	5 8 0
T. Tilling	60/–	36/6	10	10	42/6	–9d.	4 14 1
Tilling & B.A.	57/–	46/–	6	10	50/–	—	4 0 0
West Riding	46/3	30/6	10	10	33/9	—	—
Equipment and Manufacturing.							
Aron Electricity Ord. ...	40/3	31/–	15	15	1 3/8xd.	–1/6	9 12 0
Assoc. Elec. :							
Ord.	45/3	32/–	10	10	39/–	—	5 2 8
Pref.	38/9	35/6	8	8	36/6	—	4 7 8
Automatic Telephone & El.	43/–	35/–	5	10	41/3	—	4 17 1
Babcock & Wilcox ...	44/–	32/6	10	10	37/6	—	5 6 8
British Aluminium Ord. ...	54/–	40/–	10	12½	54/6	—	4 11 9
British Insulated Ord. ...	95/9	77/–	20	20	4 4/8	–1/8	4 12 10
British Thermostat (5/–) ...	16/–	9/–	17½	18½	15/9	—	5 17 6
British Vacuum Cleaner ...	35/9	27/6	5	6	28/3	—	4 5 0
Brush Ord.	5/6	4/9	Nil	Nil	5/–	—	—
Callender's	5⅛	78/6	20	20	4	–¼	4 16 8
Chloride Elec. Storage ...	77/9	61/–	15	20	77/6	—	5 0 0
Consolidated Signal ...	116/–	75/–	30	36½	4⅞	—	7 9 7
Crabtree (10/–)	29/–	22/–	17½	17½	24/6	—	7 2 10
Crompton Parkinson :							
Ord. (5/–)	32/3	18/9	12½	15	25/–xd.	–1/6	—
E. K. Cole (5/–)	8/9	4/6	5	10	6/6	—	7 13 10
Elec. & Musical Industries (10/–)	16/3	9/–	10	5	11/–	–9d.	4 11 0
Electric Construction ...	36/–	31/–	10	12½	32/6	—	7 13 10
Enfield Cable Ord. ...	5 5/8	46/–	25	25	2⅛	—	—
Electrical Switchgear (10/–)	27/–	22/6	16	16	25/9	—	6 4 4
English Electric	33/–	24/6	Nil	10	33/–	—	6 1 3
Ensign Lamps (5/–) ...	14/3	11/3	—	25	14/–	—	8 18 6
Ericsson Tel.	2 1/8	31/–	25*	25*	2 1/8	—	3 0 6
Ever Ready (5/–)	26/3	16/6	45	35	21/–	—	8 6 8
Falk Stadelmann	34/3	27/–	10	10	27/6	—	7 5 6
Ferranti Pref.	27/6	25/6	7	7	27/6	—	5 2 0
G.E.C. :							
Pref.	34/–	31/3	6½	6½	31/3	—	4 3 2
Ord.	79/3	67/–	17½	20	77/6	–6d.	5 3 3
Greenwood & Batley ...	27/6	19/–	7	15	27/6	—	10 19 0
Hall Telephone (10/–) ...	24/6	18/3	5	15	21/3	—	7 1 2
Henley's (5/–)	21/–	16/–	15	20	20/–	—	5 0 0
4½% Pref.	23/–	22/–	4½	4½	22/6	—	4 0 0
Hopkinsons	40/–	32/6	10	12½	39/6	—	6 6 7
India-Rubber Pref. ...	21/9	20/3	5½	5½	21/3	—	5 3 6
Intl. Combustion	5½	4½	5	30	5½	—	5 9 0
Ismay Industries (5/–) ...	6/9	1/–	6	6	1/3	—	—
J. Lucas	57/9	47/6	15	15	56/3	—	5 6 9
Johnson & Phillips ...	43/9	32/6	10	12½	36/3	—	6 13 4
Lancashire Dynamo ...	72/3	53/–	20	25	66/3	—	7 11 0
Laurence Scott (5/–) ...	12/–	9/–	7	15	12/–	—	6 5 0
London Elec. Wire ...	35/–	28/3	12	7½	29/6	—	5 1 8
Mather & Platt	49/–	41/3	12	13½	46/3	+1/–	5 17 0
Metropolitan Elec. Cable Pf.	22/–	21/–	5½	5½	21/3xd.	+6d.	5 3 6
Murex	93/9	66/3	20	20	78/9	—	5 2 0
Pye Deferred (5/–) ...	12/–	8/–	5	25	9/6	—	13 3 2
Revo (10/–)	36/3	30/–	12	17½	35/–xd.	+6d.	5 0 0
Reyrolle	62/6	49/–	12½	12½	55/9	—	4 10 0
Siemens Ord.	31/–	20/6	7½	7½	23/9	–9d.	6 6 4
Strand Elec. (5/–) ...	6/–	4/–	5	10	5/–	—	10 0 0
S. Smith (1/–)	9/9	6/3	37½	50	8/9	—	6 6 0
Switchgear & Cowans (5/–)	19/6	12/6	20	20	15/–	—	6 13 4
Telegraph Condenser (10/–)	18/9	12/–	5	5	12/6	—	4 0 0
Telegraph Construction ...	2½	36/–	7½	10	2⅛	—	4 14 1
Telephone Mfg. (5/–) ...	9/9	7/–	9	9	8/9	—	5 2 10
Tube Investments... ...	89/6	70/–	23¾	23¾	4⅛	—	5 15 6
Vactric (5/–)	9/9	5/–	10	10	5/–	—	10 0 0
Vickers (10/–)	27/–	17/6	10	10	23/3	–9d.	4 6 4
Westinghouse Brake ...	63/9	45/–	15	17½	56/–	—	6 5 0
Walsall Conduits (4/–) ...	26/–	22/6	—	55	25/9	+1/–	8 11 0
West, Allen (5/–)	6/6	4/6	—	7½	6/6	+3d.	5 15 5

* Dividends are paid free of Income Tax.

New Patents

Electrical specifications recently published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1937

430. "Control systems for electrically driven vehicles." K. Naumann. September 7th, 1936. (495179.)

3335. "Road traffic control systems." Siemens & General Electric Railway Signal Co., Ltd., and F. A. Downes. February 4th, 1937. (495180.)

3336. "Road traffic control systems." Siemens & General Electric Railway Signal Co., Ltd., and J. D. Noble. February 4th, 1937. (495181.)

3457. "Electric cooking ovens." A. F. Berry. February 5th, 1937. (495182.)

3852. "Television cathode-ray tubes." Radioakt.-Ges. D. S. Loewe. February 11th, 1936. (495185.)

4112. "Three-phase transformers and three-phase choking-coils." Siemens-Schuckertwerke Akt.-Ges. February 11th, 1936. (Cognate applications 4114/37, 4115/37, and 4116/37.) (495370.)

6946. "Alternating current wattmeters and wattmeter relays." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. March 10th, 1936. (495253.)

9570. "Electric impulse transmitter." H. Blechschmidt and R. Munnich. April 5th, 1937. (Convention date not granted.) (495188.)

9729. "Electrolytic method of coating surfaces of iron or steel." American Chemical Paint Co. May 12th, 1936. (495190.)

12715. "Retarded or delayed action electric motor controller or switching device." A. E. Morrison & Sons, Ltd., A. E. Morrison, and A. C. Morrison. May 4th, 1937. (Addition to 469665.) (495257.)

12782. "Automatic frequency control systems for radio receivers and the like." Marconi's Wireless Telegraph Co., Ltd., N. M. Rust and O. E. Keall. May 4th, 1937. (495313.)

13048. "Electro-magnetically operated mechanical shavers and the like." Wilkinson Sword Co., Ltd., and H. B. Randolph. May 7th, 1937. (495378.)

13192. "X-ray apparatus." British Thomson-Houston Co., Ltd. May 11th, 1936. (495435.)

13320. "Electric battery lamps." W. E. Evans. (Pertrix Chemische Fabrik Akt.-Ges.). May 10th, 1937. (Convention date not granted.) (495381.)

13321. "Electron-discharge devices for use in television or like systems." Fernseh Akt.-Ges. May 9th, 1936. (495330.)

13322. "Television and like systems." Baird Television, Ltd., and V. A. Jones. May 10th, 1937. (495331.)

13324. "Electrical fuses or cut-outs." R. Holmes, and H. C. Knott. May 10th, 1937. (495111.)

13361. "Electron multipliers." Farnsworth Television, Inc. May 16th, 1936. (495438.)

13388. "X-ray apparatus." British Thomson-Houston Co., Ltd. May 11th, 1936. (495440.)

13389. "X-ray tubes." British Thomson-Houston Co., Ltd. May 11th, 1936. (495441.)

13390. "Magnetic focusing of cathode-ray tubes." British Thomson-Houston Co., Ltd., and D. J. Bynall. May 11th, 1937. (495385.)

13392. "Regulating means for cascade-connected commutator and induction machines." A. H. Heyland and P. A. H. Mossay. May 11th, 1937. (495386.)

13407. "Electric motors." Wallace & Tiernan Products, Inc. May 18th, 1936. (495443.)

13413. "Transformers." F. C. Owen. May 12th, 1936. (495389.)

13447. "Television or like transmitting installations." Telefunken Ges. für Drahtlose Telegraphie. May 12th, 1936. (Addition to 450303.) (495394.)

13476. "Electric remote-control systems with protective arrangements." M. & C. Switchgear, Ltd., and R. Morrison. May 13th, 1937. (495335.)

13548. "Electron-discharge devices, for use in television for example." J. D. McGee. May 13th, 1937. (495338.)

13549. "Thermionic valve oscillation generators." Telefunken Ges. für Drahtlose Telegraphie. May 12th, 1936. (495404.)

13554. "Electrical frequency sensitive devices of the type suitable for automatic tuning devices for radio receivers." General Electric Co., Ltd., and G. M. Wells. May 13th, 1937. (495339.)

13557. "Mosaic electrodes for use in electron-discharge devices, and methods of manufacturing the same." Fernseh Akt.-Ges. May 12th, 1936. (495406.)

13638. "Thermionic valve amplifying circuits." Baird Television, Ltd., and W. A. Cox. May 14th, 1937. (495413.)

13640. "Means on electric supply systems for indicating when one or more of a plurality of feeders is loaded." A. Roch and A. Bovard. September 12th, 1936. (495202.)

13657. "Recording mechanism of the electro-chemical type." H. Hughes & Son, Ltd., D. O. Sproule and A. J. Hughes. May 14th, 1937. (495265.)

13669. "Combinations of an electric-discharge device and material adapted to be excited to luminescence by the discharge in the device." General Electric Co., Ltd., and J. T. Randall. May 14th, 1937. (Cognate application 30395/37.) (495415.)

13688. "High-frequency selective electrical circuit arrangements." Marconi's Wireless Telegraph Co., Ltd., and E. F. Goodenough. May 14th, 1937. (Addition to 410499.) (495455.)

13689. "Electron-discharge devices employing evacuated envelopes with seal arrangements of the re-entrant type." Marconi's Wireless Telegraph Co., Ltd., and A. J. Young. May 14th, 1937. (495417.)

13691. "Rectifier circuit arrangements." Marconi's Wireless Telegraph Co., Ltd., and N. H. Clough. May 14th, 1937. (495418.)

14779. "Electric chucking mechanism." H. G. C. Fairweather (National Acme Co.). May 27th, 1937. (495205.)

14963. "Articulated joints for electric fittings." H. C. Cooper. May 29th, 1937. (495207.)

15170. "Immersion type electric liquid-heaters." Ferranti, Ltd., and J. H. Watkiss. June 1st, 1837. (495208.)

15613. "Fuse-holders." J. A. Crabtree & Co., Ltd., H. F. McLoughlin and B. G. Harrison. June 5th, 1937. (495210.)

17440. "Electric heating elements." Revo Electric Co., Ltd., and F. H. Reeves. June 23rd, 1937. (495212.)

18168. "Telephone systems." Ericsson Telephones, Ltd., and B. A. Green. June 30th, 1937. (495213.)

19220. "Device for reducing the effects of secondary and scattered X-radiation during X-ray exposures." S. C. Cozens. July 12th, 1937. (495215.)

19290. "Electric circuit-breakers with auxiliary arcing contacts." General Electric Co., Ltd., and J. S. Cliff. July 12th, 1937. (495268.)

19945. "Switching arrangements in automatic telephone systems." Telefonaktiebolaget L. M. Ericsson. July 21st, 1936. (495216.)

20394. "Lighting fittings, particularly for electric lights." Co-operative Wholesale Society, Ltd., and R. H. Line. July 23rd, 1937. (495344.)

20617. "Electric-discharge lamps having liquid-cooled envelopes." General Electric Co., Ltd., and G. Glynn-Isaacs. July 26th, 1937. (495132.)

20794. "Electric induction motor equipments." A. Walsh, N. S. D. Gurney, and Metropolitan-Vickers Electrical Co., Ltd. July 27th, 1937. (Addition to 471113.) (495270.)

20914. "Time-delay circuits." British Thomson-Houston Co., Ltd. July 28th, 1936. (495133.)

23948. "Section insulators for contact wires of electric traction systems." British Insulated Cables, Ltd., J. Holland, and H. J. Powell. September 1st, 1937. (495224.)

28343. "Driving mechanism for selectors." Telefonaktiebolaget L. M. Ericsson. October 20th, 1936. (495347.)

31908. "Electric transformers." British Thomson-Houston Co., Ltd. November 20th, 1936. (495235.)

32195. "Electro-acoustic devices for transmitting or reproducing sound." S. H. Inkster. November 23rd, 1937. (495147.)

32552. "Telephone systems with two-party lines." Telefonaktiebolaget L.M. Ericsson. November 26th, 1936. (495355.)

32722. "Methods of producing multi-conductor signalling cables." Standard Telephones & Cables, Ltd. April 6th, 1937. (495148.)

1938

958. "Loud speakers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 14th, 1937. (495240.)

2069. "Electron-discharge apparatus." Standard Telephones & Cables, Ltd. February 26th, 1937. (495242.)

2219. "Electrical conductors having insulated coverings." P. Simons. January 24th, 1938. (495243.)

5632. "Alternating-current signalling systems." A. R. A. Rendall. February 22nd, 1938. (495162.)

7249. "Envelopes of, and leads, in high-frequency electron-discharge tubes." C. Lorenz Akt.-Ges. March 8th, 1937. (495165.)

11451. "Fluid-pressure actuated electric fusion welding-apparatus." Linde Air Products Co. May 14th, 1937. (495365.)

13956. "Electric welding." British Thomson-Houston Co., Ltd. May 11th, 1937. (495299.)

14335. "Electric convertors employing gas- or vapour-filled discharge devices." British Thomson-Houston Co., Ltd. May 13th, 1937. (495300.)

14471. "Recording mechanism of the electro-chemical type." H. Hughes & Son, Ltd., D. O. Sproule and A. J. Hughes. May 14th, 1937. (Divided out of 495265.) (495301.)

17262. "Glass electrode." Jenaer Glaswerk Schott & Gen. June 24th, 1937. (495303.)

18024. "Electron multipliers." Farnsworth Television, Inc. May 16th, 1936. (Divided out of 495438.) (495458.)

21778. "Vent and filling devices for electric accumulators." Chloride Electrical Storage Co., Ltd. (E. W. Smith). July 22nd, 1938. (495177.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 30th.

Brytallium. No. 584066. All goods in Class 6 (III).—The Brytallium Metal Co., Ltd., 26, Brazenose Street, Manchester.

Elin (lettering and design). No. 585335. Class 6 (III). Electric arc welding machines and electric motors.—Elin Gesellschaft für Elektrische Industrie, Vienna, Austria (S. Sokal, 1, Gt. James's Street, Bedford Row, W.C.1).

Eltas. No. 586804. Class 8 (III). Measuring instruments.—Bauer and Schaurte, Neuss-am-Rhein, Germany (Edmund Hunt & Co., 98, West George Street, Glasgow).

Delaron. No. 585736. Class 50 (III). Laminated material in the form of punchings, sheets, rods, &c., composed of paper-board and synthetic resin.—Thomas de la Rue & Co., Ltd., 110, Bunhill Row, E.C.2.

Traffocele. No. 601897. Class 6 (IV). Unwrought and partly wrought common metals and their alloys.—The Metropolitan-Vickers Electrical Co., Ltd., 1, Kingsway, W.C.2.

Lecupler. No. 601602. Class 9 (IV). Junction box for electric cables.—The Liverpool Electric Cable Co., Ltd., 24, Queen Anne's Gate, Westminster, S.W.1.

Simcha. No. 602097. Class 11 (IV). Electric lamps.—Simcha Tesler, 4, Court Street, E.1.

Dispolene. No. 600149. Class 17 (IV). Electrical insulating materials and electrical insulation parts.—Honeywill & Stein, 2, St. James's Square, S.W.1.

Contract Information

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Aberdeen.—December 13th. County Council. Electrical work at houses at Strichen. County Clerk.

Electrical work at houses at Longside. County Clerk, 22, Union Terrace.

Corporation. Electrical and heating work at Sunnybank school extensions. Schedules from J. A. Ogg Allen, 73a-79a, Union Street.

December 14th. Materials for a year, including electrical fittings, &c. City Engineer, Town House.

Atcham.—December 16th. R.D.C. Electrically operated pumping plant in duplicate. Willcox, Raikes & Marshall, 33, Great Charles Street, Birmingham (deposit £2 2s.).

Australia.—BRISBANE.—December 17th. Charleville Electricity Undertaking. Two motor generator sets complete with all accessories. (T.Y. 29025/1938.)*

VICTORIA.—January 17th. State Electricity Commission. Outdoor switchgear and accessories. (T. 29228/38.)*

MELBOURNE.—January 3rd. Posts and Telegraph Department. Rubber-insulated, braided, distributing wire. (T. 29245/38.)*

Barnstaple.—December 11th. Education Committee. Complete installation of electric lighting, power points and fittings in new senior boys' school. (December 2nd.)

Belfast.—December 16th. Electricity Department. Carbon-dioxide fire extinguishing equipments for sub-stations and sprayed asbestos fibre surfacing of steelwork. (See this issue.)

Bingley.—December 21st. Electricity Department. Two 400-kVA transformers. (See this issue.)

Bootle.—December 23rd. Borough Council. Sodium electric lighting in Southport Road. (December 2nd.)

Burnley.—December 15th. Electricity Department. Two 400-kVA transformers. (December 2nd.)

Cannock.—December 17th. Electricity Department. Medium and extra-high-voltage, paper-insulated, lead-covered and armoured cables, rubber-insulated cables, and single-phase prepayment meters for twelve months. (November 25th.)

Canterbury.—December 15th. Kent County Council. Electrical installations in new convalescent villas at the County Mental Hospital, Chartham Down. (November 25th.)

Chigwell.—December 31st. U.D.C. Disintegrating pump for screening and a low-lift effluent pump, together with electric motors. Howard Humphreys and Sons, 17, Victoria Street, London, S.W.1 (deposit £2 2s.).

Chile.—SANTIAGO.—December 27th. State Railways Administration. Materials for electric lighting and power services, including bare and insulated copper wire, underground cable, flexible copper cable, insulating tape, insulating varnish, ebonite, sockets, fuses, branch boxes, metal filament lamps, lampholders, electricity meters, marble switchboards and metal tubing. (T. 29787/38.)*

Cleethorpes.—December 30th. Electricity Department. High-voltage switchgear and one electric van. (December 2nd.)

Dewsbury.—December 16th. Borough Council. Installation of electric wiring at new senior girls' school, Temple Road. Town Clerk, Town Hall.

East Retford.—December 19th. Electricity Department. Three steel kiosks. (December 2nd.)

Eastbourne.—January 10th. Electricity Department. Stores and materials for twelve months; wiring for hired and hire-purchase apparatus and for assisted wiring installations. (December 2nd.)

Exeter.—January 3rd. Electricity Department. Three four-panel, 11,000-V metal-clad switchboards. (See this issue.)

Fife.—December 12th. County Council. Electric lighting at Colinsburgh housing estate (twenty houses). County Clerk (deposit £1 1s.).

December 19th. Electric lighting at Freuchie (twenty houses), and Kingskettle (twenty houses and police house) estates. County Clerk (deposit £1 1s.).

Heston and Isleworth.—December 12th. Electricity Department. Sheet-steel kiosk, extra-high-voltage switch-truck and 600-kVA transformer. (December 2nd.)

Horsham.—January 9th. Electricity Department. High-voltage main switchboard. (November 28th.)

India.—CEYLON.—March 31st. Crown Agents for the Colonies. Various works, including electrical plant, for the Ceylon Hydro-Electric Scheme. (December 2nd.)

Kent.—December 15th. County Council. Electrical work at the County Hospital, Dartford, the County Hospital, Pembury, and the Sunbridge Institution. (November 25th.)

Knaresborough.—December 17th. R.D.C. Provision and installation of an electrically driven bore-hole pump at the Council's waterworks at Burton Leonard. Clerk of the Council, R.D.C. Offices, Stockwell Road.

Liverpool.—December 12th. Electric Supply Department. Eighteen 750-kVA step-down transformers. (November 25th.)

London.—H.M. OFFICE OF WORKS.—December 13th. Installation of electrical wiring at Brackla Hill site, Bridgend R.O.F.: Installation of lightning protection system at Bishopton R.O.F. (December 2nd.)

METROPOLITAN WATER BOARD.—December 29th. One set of electrically driven centrifugal pumps. (November 25th.)

ISLINGTON.—January 11th. Borough Council. Electrical and engineers' stores for twelve months. (December 2nd.)

Manchester.—December 30th. Electricity Department. Fire-extinguishing equipment for switch houses, transformer chambers, cable passages, &c., at Dickinson "B" sub-station. (See this issue.)

Middlesbrough.—Town Council. Two electric bed lifts to be installed at the Holgate Hospital. Plans by C. Gorman, borough engineer.

New Zealand.—WELLINGTON.—March 7th. Posts and Telegraph Department. One 11,000-V outdoor type oil circuit-breaker. (T. 29017/38.)*

January 31st. 620-ft. of 11-kV single-core cable and six cable-end sealing boxes. (T.Y. 29244/38.)*

February 21st. Cable, and cable-end sealing boxes. (T. 29241/38.)*

January 25th. 500, 250 and 400 junction blocks with covers. (T. 29237/1938.)*

January 26th. Twenty-four battery testing sets. (T. 29380/38.)*

DUNEDIN.—January 9th. Electric Power and Light Department. Five 6,600-V circuit-breakers. (T.Y. 29232/38.)*

Oldham.—December 20th. Electricity Committee. Cast-iron frames and covers and earthenware conduit for twelve months. (December 2nd.)

Portsmouth.—Electricity Undertaking. One 30,000-kW turbo-alternator and two water-tube boilers. (See this issue.)

Repton.—December 16th. R.D.C. Automatic electrically operated pumping plant for the new sewage pumping station at Bretby. Consulting engineers, Wilcox, Raikes and Marshall, 33, Great Charles Street, Birmingham (deposit £2 2s.).

Skipton.—January 2nd. Electricity Department. One 11-kV and one low-voltage six-panel switchboard, and two 400-kVA indoor type transformers. (See this issue.)

South Africa.—JOHANNESBURG.—December 8th. Public Works Department. Air conditioning plant. (T. 28925/38.)*

January 5th. Railways and Harbours Administration. Train lamps and fittings for twelve months. (T. 29064/38.)*

January 3rd. Electric capstans. (T. 29585/38.)*

PRETORIA.—January 12th. Union Tender and Supplies Board. Radio receivers. (T. 29591/38.)*

December 15th. 4,200 ft. of 0.0225 sq. in. high-voltage underground cable. (T. 29197/38.)*

CAPE TOWN.—December 24th. Electricity Supply Commission. 500 30 ft. and 150 27 ft. steel electric lighting poles. (T. 29338/38.)*

St. Helens.—December 12th. Electricity Department. Underground disconnecting boxes and feeder pillars. (November 25th.)

Stockport.—December 24th. Electricity Department. Vertical and horizontal, built-up, skeleton-type sub-station switchgear for twelve months. (December 2nd.)

Wakefield.—December 12th. West Riding County Council. Electrical installation at Ecclesfield senior school. Education Officer, County Hall.

Wareham.—December 21st. Town Council. Two sets of vertical spindle centrifugal pumps and electric motors with automatic control, including all necessary accessories and incidental works, at the Northgate sewage pumping station. Lemon & Blizard, Castle Lane, Southampton (deposit £3 3s.).

West Hartlepool.—December 14th. Electricity Department. One sheet-steel kiosk sub-station, complete with high- and low-voltage equipment. (December 2nd.)

York.—December 13th. Streets and Buildings Committee. One electrically driven sewage pump at the Barmby Avenue pumping station, Fulford Road. City Engineer, Guildhall (deposit £1 1s.).

Orders Placed

Accrington.—Accepted. Cables and fittings at the James Stephenson Memorial Wing, Victoria Hospital.—Edison Swan Electric Co.

Barking.—Electricity Committee. Recommended. Switchgear.—A. Reyrolle (£373); New Switchgear Construction Co. (£117). Cable cover tiles (£46).—Cable Covers, Ltd. Protective gear (£101).—New Switchgear Construction Co. Six 400-kVA transformers (£195 each).—Bryce. Cables: Extra-high-voltage (£1,249), extra-high-voltage, plain lead covered (£1,109), and pilot and telephone (£360).—St. Helens Cable & Rubber Co.

Blackburn.—Electricity Committee. Accepted. Reconstructed type of switchgear for new sub-station.—Ferguson, Pailin.

Bolton.—Electricity Committee. Accepted. One 31,250-kW turbo-alternator.—English Electric Co. Two 150,000-lb. per hr. steam-raising units.—Babcock & Wilcox.

Durham.—Education Committee. Accepted. Electrical installation: Billingham new junior mixed school (£309).—R. Robson. Wingate Council school (£33).—W. E. Dove & Co.

Hastings.—Electricity Committee. Recommended. Transformers with automatic on-load changing equipment (£732).—Ferranti.

London.—L.C.C.—Housing and Public Health Committee. Accepted. Wiring and fittings for electric lighting, &c., in about 825 houses and flats at Downham (£6,337).—Rylands Electrical Co.

Manchester.—Housing Committee. Accepted. Electrical installations at 582 houses on the Peel Hall estate.—H. C. Taylor & Co.

Electricity Committee. Accepted. Overhead and underground distribution system for supply of electricity to Carrington and Partington.—Callender's. One 25-kVA static transformer.—British Electric Transformer Co. 6.6-kV air-break switches.—Switchgear & Equipment Co.

Plymouth.—Health Committee. Accepted. Electro-cardiograph (£165).—A. C. Cossor.

Rotherham.—Assistance Committee. Recommended. Electric truck (£275).—Windgrove & Rogers.

Rugby.—Town Council. Accepted. Sub-station equipment: Clifton Road (£360), Benn's Farm (£360), Southfields (£231), and Rugby Recreation Ground (£396).—B.T.H. Co. Cable for extension of the mains to New Station (£62) and cable for connecting Sun Street and Caldecott Park kiosks to the low-voltage system (£420).—B.I. Cables.

Seaton Valley.—U.D.C. Accepted. Electrical installation at 132 houses on the Hester Hill estate.—R. Fenn.

Stoke-on-Trent.—Gas Committee. Accepted. Electric cable (£188).—John Godden.

York.—Health Committee. Recommended. Bed lift at General Hospital (£503).—Pickerings.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Albrighton.—Houses (100); Super Homes (Wolverhampton), Ltd., St. Mary's Street, Bridgnorth.

Aberdeen.—City Hospital extension (£12,000), school, Tullos, and alterations and extensions to Ruthrieston, Frederick Street, Skene Street and Torry schools (£263,550); city architect. Extensions, with electrical work, at Sunnybank school; J. A. Ogg Allan, Union Street.

Alnwick.—Recreation centre for the U.D.C. (£27,000); G. Reavell, architect, Lloyds Bank Chambers.

Ascot.—Cinema, for the Pavilion Cinemas, Ltd., Whitehall House, Whitehall, S.W.; J. E. Farrell, staff architect.

Atherton.—Houses (30), for U.D.C.; E. L. Boydell, surveyor.

Ayr.—Houses (42), Mill Street; burgh surveyor.

Barking.—Two factories, Harts Lane; Thames Plywood Manufacturers, Ltd. Extensions to factory, River Road; Potter & Clarke, Ltd.

Bath.—Hospital (£200,000), for Royal National Hospital for Rheumatic Diseases; A. J. Taylor, architect, 4, Bridge Street.

Berkshire.—School, Abingdon; W. F. Herbert, education secretary, Shire Hall, Reading.

Birmingham.—Houses (72), Billesley Farm estate; L. Langley, Ltd. Houses (153), Erdington estate; G. Stubbings. Factory, Millpool Hill; George Newey & Co., Ltd. Shops and flats, Digbeth Street; city engineer. Schools, Dorrington Road, Perry Barr (£19,230), enlargement of Formans Road school (£13,300) and Lea Village school (£37,600), for the E.C. Extensions to Handsworth grammar school (£10,000); governors.

Blackburn.—Extensions to Blackburn technical college (£109,200); borough surveyor.

Blackpool.—Development of market site as shopping centre and underground garage (£250,000); borough surveyor.

Blyth.—Hospital, for Thomas Knight Memorial Hospital Committee; Newcombe & Newcombe, architects, Newcastle-on-Tyne.

Bognor Regis.—Dwellings (56), and restaurant, Upper Bognor Road, for L.G.O. Properties, Ltd.; Sands & Co., Ltd., builders, Chapel Road, Worthing.

Border (CUMBERLAND).—Houses (183), under five years' plan; R.D.C. surveyor.

Bromsgrove.—Houses (42), Alvechurch Road and Redditch Road; E. P. and L. C. King, Alvechurch.

Bury St. Edmund's.—Houses (74), for Thingoe R.D.C.; A. Francis Chamberlayne, clerk, Bury St. Edmund's.

Carlisle.—Hotel; H. Redfern, architect, Dean Stanley Street, London, S.W.1.

Carmarthenshire.—County offices, Carmarthen (£101,719); county architect.

Coventry.—Modern retail premises, for Jacksons, Tailors, Newcastle; Stephenson and Gillis, architects, Saville Place, Newcastle-on-Tyne.

Crewe.—Houses (102), site north of Timbrell Avenue; L. Reeves, housing architect, Municipal Buildings.

Doncaster.—Factory, Wheatley, for the International Harvester Co. of Great Britain, Ltd., 259, City Road, London, E.C.1; Wallis Gilbert & Partners, architects, 15, Elizabeth Street, London, S.W.1, in conjunction with T. H. Johnson & Son, 20, Priory Place, Doncaster.

Dudley.—Modernising 275 council houses; F. W. Jackson.

Dunston-on-Tyne.—Hotel, for Rowell and Co., Gateshead-on-Tyne; J. R. Rutherford and Sons, contractors, Minories Joinery Works, Jesmond, Newcastle-on-Tyne.

Durham.—Chapel at the College of the Venerable Bede (£10,000); John Jackson and Sons, builders, Corporation Street, Newcastle-on-Tyne. Schools, Birtley and East Hedley Hope, for the County E.C.; F. Willey, county architect, 34, Old Elvet, Durham.

Esher.—Houses (124), on several sites; H. C. Fread, U.D.C. surveyor.

Exeter.—Large extensions, Elizabeth General Hospital; R. M. Challice & Son, architects, 7, Bedford Circus.

Felling-on-Tyne.—School, for the E.C.; C. P. Sherwin, architect, 11, Northumberland Square, North Shields.

Fenton.—Houses (84), Heron Cross, for P. Bailey & Co.; A. Glyn Sherwin, architect, Newcastle.

Gateshead.—Factory, North-East Trading estate; J. H. Morton and Son, architects, Martin's Bank Chambers, South Shields.

Glasgow.—Houses (500), Broadfield, for T.C.; G. Arthur & Son, architects, 4, Graham Street, Airdrie. Houses (30), Croftfoot Road; J. Dickie & Sons, Ltd., 74, Ormonde Avenue. Skin, hide and cold storage department, Armour Street, for the Scottish Co-operative Wholesale Society; architect, S.C.W.S., 119, Paisley Road. School, Springfield Road, for the Corporation E.C.; architect, Education Offices, Bath Street.

Gorleston-on-Sea.—Pavilion and swimming pool (£19,651), Great Yarmouth; borough engineer.

Greenock.—Dairy and milk depot (£20,000), for Greenock Central Co-operative Society, Ltd.

Grimsby.—Municipal buildings, Town Hall Square; J. V. Oldfield, borough engineer, Municipal Buildings.

Guisborough (YORKSHIRE).—Extensions to the Guisborough Shirt and Underwear Factory; Mark Schmalewitsch, managing director.

Hanley.—Houses (50), near Frederick Street; H. Clowes.

Hastings.—Houses (20), Oxford Road; Hollington Estates, Ltd. Indoor bowls pavilion (£22,000); borough engineer.

Hawarden.—Houses, Broughton, Ewlpe and Saltney; G. J. Reidford, surveyor.

High Wycombe.—Houses (83); H. C. Janes, Ltd., Bicester Road, Aylesbury.

Horwich.—Fire station, Chorley New Road, for the U.D.C.; J. G. Holland & Sons (1935), Ltd., contractors, 2, Dale Street, Kearsley, Farnworth, Bolton.

Houghton-le-Spring.—Council Offices (£20,000) and sports drome (£30,000), for the U.D.C., under five years' plan; U.D.C. surveyor.

Ince-in-Makerfield.—Houses (140), Pennington estate; U.D.C. surveyor.

Jarrow-on-Tyne.—Houses (280), East Jarrow; Alfred Tinn and Co., estate agents, 17, Brunswick Place, Newcastle-on-Tyne.

Kettering.—Reconstruction of house block, Public Assistance Institution (£25,000), and extensions to laundry (£3,000); Northamptonshire Public Assistance Committee.

Leicester.—Houses (36); housing architect, Municipal Offices, Charles Street.

London.—(BETHNAL GREEN).—Tenements (55), Cooper's Garden area; L.C.C. architect, County Hall, Westminster Bridge Road, S.E.1. (LAMBETH).—Rehousing, Royal Street area; L.C.C. architect. (SOUTHWARK).—Rehousing, Lancaster Street area; L.C.C. architect. (STEPNEY).—Rehousing, Umberston Street area; L.C.C. architect. Tenements, Pennington Street; John Knox (Bristol), Ltd.; L.C.C. housing site, Caledonian Road, N.7.

Maidenhead.—Municipal offices, Park Street (£44,000); borough surveyor.

Manchester.—Houses (18), Wilbraham estate; city architect. Bus garage, West Gorton; Normantons, Ltd. Eleven-storey building, Dantzic Street and Balloon Street, for the Co-operative Wholesale Society; C.W.S. Building Department, Vere Street, Salford.

Mansfield.—Houses (193), Rock Bancroft Lane and Chesterfield Road sites, for T.C.

Market Harborough.—Cinema and shops, Northampton Road, for the Union Cinemas, Ltd.; H. Martin, Ltd., builder, Thenford Street, Northampton.

Milford Haven.—Swimming pool; U.D.C. surveyor.

Mirfield.—Shopping centre, Eastthorpe Lodge; U.D.C. surveyor.

Newcastle-on-Tyne.—Factory, Coast Road, for Harards, Ltd.; T. E. Ridley, contractor, 7, Moor Crescent, Gosforth. Reconstruction of bakery, Pitt Street, for J. M. Dickman; Davison, Eason and Harkness, builders, New Mills, Barrack Road.

Norman Cross.—Houses (264), Yaxley; Goodwin & Pywell.

Northern Ireland.—(BELFAST).—School, Orangefield; education architect, Victoria Street.

Nottinghamshire.—Schools, Worksop (£34,000), and Kilton Hill (£13,000), for the E.C.; education office, Shire Hall, Nottingham.

Paignton.—Houses (112); A. J. Proctor.

Penistone.—Houses (40), for R.D.C.; T. Potter & Son, builders, Barnsley.

Port Glasgow.—Police station and court room (£10,000); burgh surveyor.

Ripon.—Cinema, Rushford estate, for E. R. Wood; Pennington, Hustler & Taylor, architects, Ropergate, Pontefract.

Rochdale.—Houses (900); S. H. Morgan, borough surveyor.

Rochester.—Factory, Temple estate, for Short Bros., Ltd.

Rothesay.—Reconstruction of Glenburn Hydropathic (lifts, &c.), £20,000; J. Cowan Sloan, Wemyss Bay, proprietor.

Royston (YORKSHIRE).—Combined public hall and swimming baths for U.D.C.; Husband & Clark, architects, 388, Glossop Road, Sheffield, 10.

Scarborough.—Houses (104), Barrowcliff estate, for the T.C.; Mollekin Bros., builders, Rotherham.

Sheffield.—Large works, Penistone Road, for W. R. Swann & Co., Ltd., Owlerton.

Shipley.—Houses (369), Moorhead Lane; W. Illingworth, architect, 15, Sunbridge Road, Bradford.

South Shields.—Tuberculosis hospital, Cleadon (£12,000), and sports centre, Gypsies Green, for the T.C. (£92,000); borough engineer. Hotel, Marsden, South Shields; G. Henderson, contractor, Boldon Lane, East Boldon.

Spalding.—Houses (74); R.D.C. surveyor.

Staffordshire.—School, Butterton, near Leek; F. A. Hughes, director of education, County Education Offices, Stafford.

Staines.—Houses (95), Worple Road, Laleham; Jubb & Jackson.

Sunderland.—Concert hall, Seaburn (£13,696); borough engineer. Enlargement of Monkswearmouth.

Sutton Coldfield.—Houses (14), near Clarence Road; W. A. Morgan.

Tow Law (Co. DURHAM).—Houses (32) for North Eastern Housing Association; G. M. Pearson, builder, Houghton Road, Hetton.

Uxbridge.—Houses (120), Church Hill; U.D.C. surveyor.

Warrington.—Houses (20), Fitzherbert Street; Ward & Lambert.

West Bromwich.—Offices and warehouse, Greets Green Road; W. Frernshough, Ltd. School, Hall Green Road (£39,441); W. Kendrick & Sons, Ltd. Extensions to works, Albion Road; Hills Patent Glazing Co.

West Ham.—Tenements, Beckton Road; borough engineer.

Whickham-on-Tyne.—Houses (119), Dunston, Swalwell and Sunniside; U.D.C. surveyor.

Whitley Bay.—Houses (10), Fairfield Green estate; Stephenson and Gillis, architects, 2, Saville Place, Newcastle-on-Tyne.

Worthing.—Houses (26), Vale Walk; F. Kenton.

Yiewsley.—Houses (204), Bell Farm estate, West Drayton; W. T. Morgan, engineer, Council Offices, Yiewsley.

York.—Houses (30) and flats, Cemetery Road; city architect.

Yorkshire.—Completion of Yorkshire Institute of Agriculture, Askham Bryan, West Riding (£101,000); director of education, Wakefield.